

# **Research and Development in Industry: 1997**

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**Funds, 1997  
Scientists and Engineers, January 1998**

## **Detailed Statistical Tables**

**Division of Science Resources Studies  
Directorate for Social, Behavioral, and Economic Sciences**

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**National Science Foundation**



**September 1999**

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## Detailed Statistical Tables

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Division of Science Resources Studies  
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September 1999

**National Science Foundation**

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# INTRODUCTION

This report is the second of two publications containing results from the 1997 Survey of Industrial Research and Development. The first publication, a topical report announcing the availability of survey results, contains analytical information and highlights the increase in industrial research and development (R&D) funded from companies' own resources and the increased sales and employment reported by R&D-performing firms. This report contains the full set of statistics produced from the survey as well as statistics on R&D funding for the years 1987–97 and on R&D personnel for the period January 1988 to January 1998.

The report also provides national estimates of the expenditures on R&D performed within the United States by industrial firms, whether U.S.- or foreign-owned. Among the statistics are estimates of total R&D, the portion of the total financed by the Federal Government, and the portion financed by the companies themselves or by other non-federal sources such as state and local governments or other industrial firms under contract or subcontract. Total R&D is also separated into its character of work components: basic research, applied research, and development. Other statistics include R&D financed by a domestic firm but performed outside the United States, R&D contracted to organizations outside of the firm, and the funds spent to perform energy-related R&D. The report provides information on R&D performing firms including domestic net sales, number of employees, number of R&D-performing scientists and engineers, and cost per R&D scientist and engineer.

The Survey of Industrial Research and Development is an annual sample survey that intends to include or represent all for-profit R&D-performing companies, either publicly or privately held. The survey's primary focus is on U.S. industry as a performer of, rather than as a source of funds for, R&D. Thus, data on Federal support of R&D activities performed by industry are collected, and the resulting statistics appear in several tables; while statistics on industrial funding of R&D undertaken at universities and colleges and other nonprofit organizations

are not collected or included.<sup>1</sup> The result of collecting and publishing performer-reported statistics is that the federally funded R&D performance totals presented in this report differ from the totals reported by the Federal agencies that provide the funds and the statistics published in NSF's *Federal Funds for Research and Development* report series. One reason for these differences is that performers of R&D often expend Federal funds in a year other than the one in which the Federal Government provides authorization, obligations, or outlays. (For definitions of these terms, see section B, "Comparisons to Other Statistical Series.") During the past several years, the differences have widened between the Federal R&D funding reported by performers and that reported by funding agencies. The report, *National Patterns of R&D Resources: 1998* (NSF 99-335), documented and analyzed these differences.

Industry statistics in this report are developed from data collected from individual companies.<sup>2</sup> Since the survey is company-based rather than establishment-based, all data collected for the various components of each company (plants, divisions, or subdivisions) are tabulated in the company's major standard industrial classification (SIC). The resulting industry estimates are reported using the SIC of the companies within each industry. National totals are estimated by summing the industry estimates.

Prior to the 1994 survey cycle, all companies that spent more than \$1 million annually on R&D in the United States or had 1,000 or more employees received a survey questionnaire every year. Beginning with the 1994 cycle, the employee cutoff was dropped from the criteria; beginning with the 1996 cycle, the R&D level was raised to \$5 million, where it remained for the 1997 survey. For all cycles of the survey, the remaining firms (i.e., those that are not considered "certainties" because

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<sup>1</sup> Data on R&D performed at universities and colleges are collected in the annual Survey of Research and Development Expenditures at Universities and Colleges. Resumption of a survey of other nonprofit organizations, discontinued in the mid-1970s, is under way. More information about these surveys is available from NSF's Research and Development Statistics Program in the Division of Science Resources Studies.

<sup>2</sup> In this survey and in the publications presenting statistics resulting from the survey, the terms "firm," "company," and "enterprise" are used interchangeably. "Industry" refers to the activity or group of activities included in the 2- or 3-digit standard industrial classifications (SICs) or groups of SICs used to array statistics resulting from the Survey of Industrial Research and Development.

of the selection criteria) are subjected to probability sampling and may or may not receive a questionnaire for a given survey year. Among the organizations purposely excluded from the survey are trade associations and not-for-profit industrial consortia. Although their primary mission is to serve industry, these associations are excluded because they are nonprofit organizations.

Respondents receive detailed definitions to help them determine which expenses to include or exclude from the R&D data they provide. Nevertheless, the statistics presented in this report are subject to response and concept errors caused by differences in the way respondents interpret the definitions of R&D activities and by variations in company accounting procedures.

The National Science Foundation Act of 1950, as amended, authorizes and directs the National Science Foundation (NSF) "...to provide a central clearinghouse for the collection, interpretation, and analysis of data on the availability of, and the current and projected need for, scientific and technical resources in the United States, and to provide a source of information for policy formulation by other agencies of the Federal Government." The Survey of Industrial Research and Development is the vehicle with which NSF carries out the industrial portion of this mandate. NSF's Division of Science Resources Studies has sponsored and managed a survey of industrial R&D since 1953. The Bureau of Labor Statistics (BLS) in the U.S. Department of Labor conducted the 1953–56 surveys.<sup>3</sup> Since 1957, the Bureau of the Census in the U.S. Department of Commerce has conducted the survey.<sup>4</sup> Census staff conduct the survey under Title 13 of the United States Code, which prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, in some tables of this report, the symbol "(D)" is used to indicate that estimates are being withheld to avoid possible disclosure of information about operations of individual companies.

The content of the survey has been expanded and refined over the years in response to an increasing need by policymakers for more detailed information on the nation's R&D effort. For example, questions on energy R&D were added in the early 1970s, following the first

oil shortage crisis. On the other hand, the frequency of collection of certain data items has been reduced in recent years in an attempt to alleviate some of the respondent burden. For large firms known to perform R&D, a detailed questionnaire (Form RD-1L) is used to collect data for odd-numbered years, and an abbreviated version (Form RD-1S) is used to collect data for even-numbered years. To further limit the reporting burden on small R&D performers and firms included in the sample for the first time, an even more abbreviated form (Form RD-1A), which collects only the most crucial data, is used each year.

Several changes have been made to the survey since the early 1990s that are of special importance to users of this report. Prior to the 1992 survey, statistics were based on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, and 1987). In intervening years, a subset of the last sample, a panel, was used. The most recent sample before the 1992 survey was selected and first used for survey year 1987. Original estimates for 1988–91 were based on surveys of approximately 1,700 panel companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics were based on samples selected annually. Also beginning with the 1992 survey, the sample size was increased from approximately 14,000 to approximately 25,000 firms. Annual sampling and the increase in sample size were instituted for several reasons: (1) to account better for births of R&D-performing establishments in the survey universe; (2) to survey more fully and accurately R&D performed by nonmanufacturing firms, especially in the service sector; and (3) to gather more current information about potential R&D performers.

Tables containing the statistics resulting from the 1997 survey are provided in section A. Detailed information about the history of the survey, survey methodology, comparability of the statistics, survey definitions, and other technical notes is provided in section B. Survey questionnaires, instructions, and other survey documents are reproduced in section C. Specific questions regarding the survey may be directed to Raymond Wolfe at (703) 306-1772, [rwlfe@nsf.gov](mailto:rwlfe@nsf.gov) (e-mail), or at the following mailing address:

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<sup>3</sup> See NSF (1956) and NSF (1960).

<sup>4</sup> Data obtained in the earlier BLS surveys are not directly comparable with Census figures due to methodological and other differences.

## NOTE TO USERS OF HISTORICAL STATISTICS

For accurate historical statistics for 1987–97, use only the detailed statistical tables in this report and not those published earlier. As a result of a new sample design, statistics for 1988–91 have been revised since their original publication. These revised statistics were first published in *Research and Development in Industry: 1992* (NSF 95-324) and better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. Also, before the 1995 survey cycle, data for previous years were reviewed for consistency with current year responses and were revised systematically during processing. This practice of routinely revising already published statistics has been discontinued. Because of these changes, this report contains the latest revised statistics from the Survey of Industrial Research and Development for 1987–97. These changes and others are discussed in section B.

# SECTION A. DETAILED STATISTICAL TABLES

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# TABLE NOTES

These notes pertain to the tables in this section and in section B except as noted in footnotes and other explanatory information noted at the end of specific tables.

## REPORTING UNITS

The basic reporting unit is the company, firm, or enterprise that included all establishments under common ownership or control. All R&D expenditures and all scientists and engineers of each company were classified into a single SIC code and size category.

## COMPANY SIZE

Companies are categorized by total number of domestic employees. The following are the six size classes used in this report:

- fewer than 500 employees;
- 500 to 999 employees;
- 1,000 to 4,999 employees;
- 5,000 to 9,999 employees;
- 10,000 to 24,999 employees; and
- 25,000 or more employees.

## CURRENT AND CONSTANT DOLLARS

Statistics in all tables are reported in current dollars. Constant dollars are also presented in the summary tables (A-1, A-26, A-27, and A-28). Gross domestic product (GDP) implicit price deflators were used to convert current to constant dollars.

## DISCLOSURE AND SUPPRESSION OF STATISTICS

Title 13 of the United States Code prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, the

data in some table cells may have been deleted and replaced with "(D)." This occurs when a small number of companies account for a large percentage of the estimate in a particular data cell. Although publication of certain cells may be withheld, the estimates in the cells are always included in totals. The tables most often affected by this rule are those that contain data on Federal support for R&D performance.

## GEOGRAPHIC STATISTICS

The statistics cover only those operations located in the 50 states and the District of Columbia. Statistics on company-sponsored R&D performed outside the United States by foreign subsidiaries of U.S. domestic companies are included in table A-11 but excluded from all other tables.

## IMPUTATION

Missing data are imputed for some data items. Therefore, the statistics in some table cells may be accompanied by the notation "(S)," which indicates that the imputation rate—the percentage of the statistic not reported by respondents and consequently estimated—exceeds 50 percent for that item. In such cases, the estimate may be statistically unreliable. See table B-4 for imputation rates for specific items.

## INDUSTRY CLASSIFICATION

One SIC code was assigned to each company. A single SIC code was assigned to multi-establishment companies based on the code that represented the most dominant aggregated activity for that firm in terms of total payroll. Statistics for the following industry groupings are published in this report (SIC codes are shown in parentheses<sup>5</sup>):

- Food, kindred, and tobacco products (20, 21)
- Food and kindred products (20)
- Tobacco products (21)
- Textiles and apparel (22, 23)

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<sup>5</sup>The 1997 sample uses the 1987 revision of the SIC system.

|   |   |
|---|---|
| Textile mill products (22)                                      | Transportation and utilities (40–42, 44–49)   |
| Apparel (23)  | Communications (48)   |
| Lumber, wood products, and furniture (24, 25)                   | Telephone communications (481)  |
| Lumber and wood products, except furniture (24)                 | Other communications (482–84, 489)  |
| Furniture and fixtures (25)                                     | Electric, gas, and sanitary services (49)   |
| Paper and allied products (26)                                  | Other transportation and utilities (40–42, 44–47)   |
| Printing, publishing, and allied industries (27)                | Trade (50–59)   |
| Chemicals and allied products (28)                              | Finance, insurance, and real estate (60–65, 67)   |
| Industrial chemicals (281–82, 286)                              | Services (701, 72, 73, 75–81, 83, 84, 87, 89)   |
| Drugs and medicines (283)                                       | Business services (73)  |
| Other chemicals (284–85, 287–89)                                | Computer and data processing services (737)   |
| Petroleum refining and extraction (13, 29)                      | Other business services (731–36, 738)   |
| Rubber products (30)  | Health services (80)  |
| Leather and leather goods (31)                                  | Offices and clinics of medical doctors, hospitals, medical and dental labs (801, 806, 807)  |
| Stone, clay, and glass products (32)                            | Other health services (802–5, 808–9)  |
| Primary metals (33)   | Engineering and management services (87)  |
| Ferrous metals and products (331–32, 3398–99)                   | Engineering, architectural, and surveying (871)   |
| Nonferrous metals and products (333–36)                         | Research, development, and testing (873)  |
| Fabricated metal products (34)                                  | Other engineering and management services (872, 874)  |
| Machinery (35)  | Other services (701, 72, 75–79, 81, 83, 84, 89)   |
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<sup>6</sup>Because of the close similarity of their R&D activities, companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts.

## PERCENTAGES

Percentages were calculated on the basis of thousands of dollars and may differ from those calculated using the rounded figures shown.

## ROUNDING

Because of rounding, details may not add to totals.

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Table A-1. Trends in industrial R&amp;D performance, by source of funds, in current and constant dollars: 1953-97

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| Year      | Total R&D             |                             | Federal            |                             | Company <sup>1</sup> |                             |
|-----------|-----------------------|-----------------------------|--------------------|-----------------------------|----------------------|-----------------------------|
|           | Current<br>dollars    | Constant<br>1992<br>dollars | Current<br>dollars | Constant<br>1992<br>dollars | Current<br>dollars   | Constant<br>1992<br>dollars |
|           | [Dollars in millions] |                             |                    |                             |                      |                             |
| 1953..... | 3,630                 | 17,988                      | 1,430              | 7,086                       | 2,200                | 10,902                      |
| 1954..... | 4,070                 | 19,941                      | 1,750              | 8,574                       | 2,320                | 11,367                      |
| 1955..... | 4,640                 | 22,372                      | 2,180              | 10,511                      | 2,460                | 11,861                      |
| 1956..... | 6,605                 | 30,764                      | 3,328              | 15,501                      | 3,277                | 15,263                      |
| 1957..... | 7,731                 | 34,856                      | 4,335              | 19,545                      | 3,396                | 15,311                      |
| 1958..... | 8,389                 | 36,940                      | 4,759              | 20,956                      | 3,630                | 15,984                      |
| 1959..... | 9,618                 | 41,908                      | 5,635              | 24,553                      | 3,983                | 17,355                      |
| 1960..... | 10,509                | 45,161                      | 6,081              | 26,132                      | 4,428                | 19,029                      |
| 1961..... | 10,908                | 46,338                      | 6,240              | 26,508                      | 4,668                | 19,830                      |
| 1962..... | 11,464                | 48,087                      | 6,434              | 26,988                      | 5,029                | 21,095                      |
| 1963..... | 12,630                | 52,363                      | 7,270              | 30,141                      | 5,360                | 22,222                      |
| 1964..... | 13,512                | 55,196                      | 7,720              | 31,536                      | 5,792                | 23,660                      |
| 1965..... | 14,185                | 56,831                      | 7,740              | 31,010                      | 6,445                | 25,821                      |
| 1966..... | 15,548                | 60,569                      | 8,332              | 32,458                      | 7,216                | 28,111                      |
| 1967..... | 16,385                | 61,854                      | 8,365              | 31,578                      | 8,020                | 30,276                      |
| 1968..... | 17,429                | 63,057                      | 8,560              | 30,970                      | 8,869                | 32,088                      |
| 1969..... | 18,308                | 63,262                      | 8,451              | 29,202                      | 9,857                | 34,060                      |
| 1970..... | 18,067                | 59,275                      | 7,779              | 25,522                      | 10,288               | 33,753                      |
| 1971..... | 18,320                | 57,143                      | 7,666              | 23,911                      | 10,654               | 33,231                      |
| 1972..... | 19,552                | 58,504                      | 8,017              | 23,989                      | 11,535               | 34,515                      |
| 1973..... | 21,249                | 60,195                      | 8,145              | 23,074                      | 13,104               | 37,122                      |
| 1974..... | 22,887                | 59,493                      | 8,220              | 21,367                      | 14,667               | 38,126                      |
| 1975..... | 24,187                | 57,465                      | 8,605              | 20,444                      | 15,582               | 37,021                      |
| 1976..... | 26,997                | 60,599                      | 9,561              | 21,461                      | 17,436               | 39,138                      |
| 1977..... | 29,825                | 62,882                      | 10,485             | 22,106                      | 19,340               | 40,776                      |
| 1978..... | 33,304                | 65,443                      | 11,189             | 21,987                      | 22,115               | 43,456                      |
| 1979..... | 38,226                | 69,212                      | 12,518             | 22,665                      | 25,708               | 46,547                      |
| 1980..... | 44,505                | 73,769                      | 14,029             | 23,254                      | 30,476               | 50,515                      |
| 1981..... | 51,810                | 78,488                      | 16,382             | 24,817                      | 35,428               | 53,671                      |
| 1982..... | 58,650                | 83,583                      | 18,545             | 26,429                      | 40,105               | 57,154                      |
| 1983..... | 65,268                | 89,213                      | 20,680             | 28,267                      | 44,588               | 60,946                      |
| 1984..... | 74,800                | 98,525                      | 23,396             | 30,817                      | 51,404               | 67,708                      |
| 1985..... | 84,239                | 107,270                     | 27,196             | 34,631                      | 57,043               | 72,638                      |
| 1986..... | 87,823                | 108,989                     | 27,891             | 34,613                      | 59,932               | 74,376                      |
| 1987..... | 92,155                | 110,950                     | 30,752             | 37,024                      | 61,403               | 73,926                      |
| 1988..... | 97,015                | 112,690                     | 30,343             | 35,246                      | 66,672               | 77,445                      |
| 1989..... | 102,055               | 113,748                     | 28,554             | 31,826                      | 73,501               | 81,923                      |

See explanatory information and SOURCE at end of table.

**Table A-1. Trends in industrial R&D performance, by source of funds, in current and constant dollars: 1953-97**

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| Year       | Total R&D             |                             | Federal            |                             | Company <sup>1</sup> |                             |
|------------|-----------------------|-----------------------------|--------------------|-----------------------------|----------------------|-----------------------------|
|            | Current<br>dollars    | Constant<br>1992<br>dollars | Current<br>dollars | Constant<br>1992<br>dollars | Current<br>dollars   | Constant<br>1992<br>dollars |
|            | [Dollars in millions] |                             |                    |                             |                      |                             |
| 1990.....  | 109,727               | 117,230                     | 28,125             | 30,048                      | 81,602               | 87,182                      |
| 1991.....  | 116,952               | 120,173                     | 26,372             | 27,098                      | 90,580               | 93,074                      |
| 1992.....  | 119,110               | 119,110                     | 24,722             | 24,722                      | 94,388               | 94,388                      |
| 1993.....  | 117,400               | 114,380                     | 22,809             | 22,222                      | 94,591               | 92,158                      |
| 1994 ..... | 119,595               | 113,802                     | 22,463             | 21,375                      | 97,131               | 92,426                      |
| 1995 ..... | 132,103               | 122,875                     | 23,451             | 21,813                      | 108,652              | 101,062                     |
| 1996 ..... | 144,667               | 132,080                     | 23,653             | 21,595                      | 121,015              | 110,486                     |
| 1997 ..... | 157,539               | 141,202                     | 23,928             | 21,447                      | 133,611              | 119,755                     |

<sup>1</sup> Company-funded R&D includes funds for industrial R&D performed within company facilities from all sources except the Federal Government. The funds predominately are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and state governments. Company-financed R&D not performed within the company is excluded.

**NOTES:** Gross domestic product (GDP) implicit price deflators were used to convert current dollars to constant (1992) dollars.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-2. Summary data for R&amp;D-performing companies, by detailed industry and size of company: 1996-97

Page 1 of 4

| Industry and size of company                              | SIC code | Research and development funds |         |           |        |         |         | Domestic net sales |           | R&D scientists and engineers |           | Domestic employment |        |
|---|----------|--------------------------------|---------|-----------|--------|---------|---------|--------------------|-----------|------------------------------|-----------|---------------------|--------|
|   |          | Total                          |         | Federal   |        | Company |         |                    |           | January <sup>3</sup>         | March     |                     |        |
|   |          | 1996                           | 1997    | 1996      | 1997   | 1996    | 1997    | 1996               | 1997      | 1997                         | 1998      | 1996                | 1997   |
|   |          | [Dollars in millions]          |         |           |        |         |         |                    |           |                              |           | [In thousands]      |        |
| All Industries.....                                       |          | 144,667                        | 157,539 | 23,653    | 23,928 | 121,015 | 133,611 | 4,076,076          | 4,573,376 | 885.7                        | 951.5     | 18,102              | 20,221 |
| Distribution by industry:                                 |          |                                |         |           |        |         |         |                    |           |                              |           |                     |        |
| Manufacturing <sup>1</sup> .....                          |          | 111,864                        | 121,025 | 20,020    | 19,823 | 91,845  | 101,202 | 2,765,725          | 3,084,508 | (D)                          | 682       | 11,347              | 11,700 |
| Food and kindred products.....                            | 20       | (D)                            | 1,808   | 1         | 0      | (D)     | 1,808   | 330,963            | 366,014   | (D)                          | 12        | 1,033               | 1,236  |
| Tobacco products.....                                     | 21       | (D)                            | (D)     | 0         | 0      | (D)     | (D)     | 19,630             | (D)       | (D)                          | (D)       | 57                  | 12     |
| Textile mill products.....                                | 22       | (D)                            | (D)     | (D)       | (D)    | 303     | 265     | 38,592             | 33,660    | 2.6                          | 2.4       | 332                 | 261    |
| Apparel.....  | 23       | (D)                            | (D)     | (D)       | (D)    | 113     | 242     | 12,946             | 19,187    | 1.2                          | 1.7       | 102                 | 140    |
| Lumber and wood products, except furniture.....           | 24       | (D)                            | 60      | (D)       | 0      | 55      | 60      | 15,502             | 11,955    | 0.6                          | (D)       | 94                  | 78     |
| Furniture and fixtures.....                               | 25       | (D)                            | 314     | (D)       | 0      | 598     | 314     | 31,734             | 29,100    | 3.0 (S)                      | 3.2       | 245                 | 177    |
| Paper and allied products.....                            | 26       | (D)                            | (D)     | (D)       | (D)    | 1,558   | 1,491   | 134,607            | 135,350   | 11.5 (S)                     | 11.1 (S)  | 568                 | 554    |
| Printing, publishing, and allied industries.....          | 27       | (D)                            | 367     | (D)       | 0      | 325     | 367     | 35,739             | 48,225    | 3.4 (S)                      | 2.4       | 303                 | 321    |
| Chemicals and allied products.....                        | 28       | (D)                            | (D)     | (D)       | (D)    | 17,698  | 18,693  | 335,642            | 353,639   | 91.8                         | 91.2      | 1,069               | 1,043  |
| Petroleum refining and extraction.....                    | 13,29    | 1,662                          | (D)     | 24        | (D)    | 1,638   | 1,651   | 249,436            | 282,965   | 9.1                          | 8.0       | 288                 | 242    |
| Rubber products.....                                      | 30       | (D)                            | (D)     | (D)       | (D)    | 1,334   | 1,406   | 74,124             | 100,785   | 11.5                         | 12.0      | 472                 | 482    |
| Leather and leather products...                           | 31       | (D)                            | 42      | (D)       | (D)    | 41      | (D)     | 13,463             | (D)       | 0.3                          | 0.2       | 48                  | 52     |
| Stone, clay, and glass products.....                      | 32       | 517                            | 619     | 5         | 2      | 512     | 617     | 38,899             | 33,440    | 4.4                          | 4.0 (S)   | 197                 | 169    |
| Primary metals.....                                       | 33       | (D)                            | 988     | (D)       | 221    | 637     | 767     | 103,908            | 133,940   | 5.5 (S)                      | 6.4 (S)   | 406                 | 494    |
| Fabricated metal products.....                            | 34       | (D)                            | 1,818   | (D)       | 129    | 1,460   | 1,689   | 98,175             | 110,588   | 11.0                         | 13.2      | 617                 | 686    |
| Machinery.....  | 35       | 13,685                         | 19,250  | 117       | 230    | 13,568  | 19,020  | 264,217            | 333,668   | 92.0                         | 116.6     | 1,355               | 1,423  |
| Electrical equipment.....                                 | 36       | 22,826                         | 24,972  | 2,176     | 1,839  | 20,650  | 23,134  | 338,164            | 403,147   | 140.8                        | 176.6     | 1,430               | 1,630  |
| Transportation.....                                       | 37       | 32,810                         | 31,997  | 12,203    | 12,251 | 20,607  | 19,746  | 501,357            | 517,156   | 162.8 (S)                    | 144.2 (S) | 1,957               | 1,837  |
| Professional and scientific instruments.....              | 38       | 13,091                         | 13,835  | 4,393 (S) | 4,520  | 8,698   | 9,315   | 111,499            | 119,289   | 72.9 (S)                     | 71.6 (S)  | 641                 | 705    |
| Miscellaneous manufacturing industries <sup>2</sup> ..... | 39       | 490                            | 545     | 3         | 0      | 488     | 545     | 17,128             | 31,066    | 5.0                          | 4.6       | 133                 | 157    |

See explanatory information and SOURCE at end of table.

Table A-2. Summary data for R&amp;D-performing companies, by detailed industry and size of company: 1996-97

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| Industry and size of company  | SIC code | Research and development funds |        |         |       |         |        | Domestic net sales |           | R&D scientists and engineers |         | Domestic employment |       |
|---|----------|--------------------------------|--------|---------|-------|---------|--------|--------------------|-----------|------------------------------|---------|---------------------|-------|
|   |          | Total                          |        | Federal |       | Company |        |                    |           | January <sup>3</sup>         | March   | 1997                | 1998  |
|   |          | 1996                           | 1997   | 1996    | 1997  | 1996    | 1997   | 1996               | 1997      | 1997                         | 1998    | 1996                | 1997  |
|   |          | [Dollars in millions]          |        |         |       |         |        |                    |           |                              |         |                     |       |
| Distribution by industry:   |          |                                |        |         |       |         |        |                    |           |                              |         |                     |       |
| Nonmanufacturing <sup>1</sup> .....   |          | 32,803                         | 36,514 | 3,633   | 4,105 | 29,170  | 32,409 | 1,310,352          | 1,488,869 | 245.8                        | 269.5   | 6,755               | 8,521 |
| Agricultural services.....  | 07-09    | 44                             | 7      | 0       | 0     | 44      | 7      | 1,068              | 1,522     | 0.4                          | 0.1     | 12                  | 18    |
| Mining.....   | 10-14    | 77                             | (D)    | 8       | (D)   | 68      | 97     | 17,693             | 28,958    | 0.6                          | 0.7     | 64                  | 78    |
| Construction.....   | 15-17    | 283                            | 261    | 0       | 1     | 283     | 260    | 13,864             | 14,511    | 3.3                          | 2.6     | 96                  | 102   |
| Railroad transportation.....  | 40       | 34                             | (D)    | 0       | (D)   | 34      | 5      | 24,968             | 25,465    | (D)                          | 0       | 143                 | 132   |
| Local and suburban transit and interurban highway passenger transportation..... | 41       | 0                              | 0      | 0       | 0     | 0       | 0      | 0                  | 0         | (D)                          | 0       | 0                   | 0     |
| Motor freight transportation and warehousing.....                               | 42       | 39                             | 600    | 0       | 0     | 39      | 600    | 26,267             | 154,511   | (D)                          | 5       | (D)                 | 2,073 |
| Water transportation.....   | 44       | 0                              | (D)    | 0       | 0     | 0       | (D)    | 0                  | (D)       | (D)                          | (D)     | 0                   | (D)   |
| Transportation by air.....  | 45       | 32                             | (D)    | 12      | (D)   | 20      | 55     | (D)                | 11,579    | 0.1 (S)                      | 0.2     | (D)                 | 136   |
| Pipelines, except natural gas.....  | 46       | 0                              | 0      | 0       | 0     | 0       | 0      | 0                  | 0         | 0.0                          | 0.0     | 0                   | 0     |
| Transportation services.....  | 47       | 118                            | 9      | 0       | 0     | 118     | 9      | (D)                | (D)       | (D)                          | (D)     | 7                   | 4 (S) |
| Communications.....   | 48       | 4,103                          | (D)    | 133     | (D)   | 3,970   | 1,884  | 211,857            | 278,724   | 24.7                         | 8.4 (S) | 826                 | 1,109 |
| Electric, gas, and sanitary services.....                                       | 49       | 352                            | (D)    | 42      | (D)   | 311     | 258    | 182,121            | 188,859   | 4.0 (S)                      | 1.1     | 593                 | 525   |
| Durable goods.....  | 50       | 4,961                          | (D)    | 37      | (D)   | 4,925   | 6,006  | 104,604            | 118,830   | 34.3                         | 36.0    | 384                 | 386   |
| Nondurable goods.....   | 51       | 901                            | (D)    | 0       | (D)   | 901     | 1,712  | 68,525             | 95,125    | 6.6                          | 8.6     | 171                 | 232   |
| Building materials, hardware, garden supply and mobile home dealers.....        | 52       | 4                              | 5      | 0       | 0     | 4       | 5      | (D)                | (D)       | (D)                          | 0       | (D)                 | (D)   |
| General merchandise stores....  | 53       | 0                              | 0      | 0       | 0     | 0       | 0      | 0                  | 0         | 0.0                          | 0.0     | 0                   | 0     |
| Food stores.....  | 54       | 24                             | 66     | 0       | 0     | 24      | 66     | (D)                | 30,944    | (D)                          | 1       | (D)                 | 203   |
| Automotive dealers and gasoline service stations....                            | 55       | 0                              | 0      | 0       | 0     | 0       | 0      | 0                  | 0         | (D)                          | 0       | 0                   | 0     |
| Apparel and accessory stores.....   | 56       | 10                             | (D)    | 0       | 0     | 10      | (D)    | (D)                | (D)       | (D)                          | 0       | (D)                 | (D)   |
| Home furniture, furnishings and equipment stores.....                           | 57       | 78                             | 94     | 0       | 0     | 78      | 94     | (D)                | (D)       | 0.8 (S)                      | 0.9     | (D)                 | (D)   |

See explanatory information and SOURCE at end of table.

Table A-2. Summary data for R&amp;D-performing companies, by detailed industry and size of company: 1996-97

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| Industry and size of company  | SIC code | Research and development funds |        |         |      |         |        | Domestic net sales |         | R&D scientists and engineers |         | Domestic employment |       |
|---|----------|--------------------------------|--------|---------|------|---------|--------|--------------------|---------|------------------------------|---------|---------------------|-------|
|   |          | Total                          |        | Federal |      | Company |        |                    |         | January <sup>3</sup>         | March   |                     |       |
|   |          | 1996                           | 1997   | 1996    | 1997 | 1996    | 1997   | 1996               | 1997    | 1997                         | 1998    | 1996                | 1997  |
|   |          | [Dollars in millions]          |        |         |      |         |        |                    |         |                              |         |                     |       |
| Distribution by industry:   |          |                                |        |         |      |         |        |                    |         |                              |         |                     |       |
| Eating and drinking places.....   | 58       | 141                            | 139    | 0       | 0    | 141     | 139    | 61,807             | 58,016  | 0.4 (S)                      | 0.9     | 683                 | 651   |
| Miscellaneous retail.....   | 59       | 386                            | 83     | 0       | 0    | 386     | 83     | 2,553              | 9,806   | 1.8                          | 0.9     | 20                  | 82    |
| Depository institutions.....  | 60       | 378                            | 450    | 0       | 0    | 378     | 450    | 71,801             | 59,163  | 4.4                          | 4.7     | 327                 | 257   |
| Nondepository credit institutions.....                                  | 61       | 88                             | (D)    | 0       | 0    | 88      | (D)    | 6,165              | 6,914   | (D)                          | (D)     | 16                  | 17    |
| Security and commodity brokers, dealers and exchanges, and services.... | 62       | 321                            | 442    | 0       | 0    | 321     | 442    | (D)                | 20,713  | (D)                          | 3       | (D)                 | 61    |
| Insurance carriers, agents, brokers and services.....                   | 63,64    | 445                            | 210    | 0       | 0    | 445     | 210    | 210,014            | 135,451 | 7.8                          | 4.0     | 343                 | 210   |
| Real estate; holding and other investment offices.....                  | 65,67    | 65                             | (D)    | 2       | (D)  | 62      | 325    | (D)                | 4,438   | 0.9                          | 5.7 (S) | (D)                 | 39    |
| Hotels and personal services.....                                       | 701,72   | 131                            | 16     | 0       | 0    | 130     | 16     | 7,591              | 11,091  | 0.5                          | 0.2     | 78                  | 178   |
| Business services.....  | 73       | 10,685                         | 12,321 | 361     | 400  | 10,325  | 11,921 | 104,899            | 109,755 | 89.0                         | 113.0   | 1,432               | 1,342 |
| Automotive and miscellaneous repair, services and parking.....          | 75,76    | 47                             | 258    | 0       | 6    | 47      | 252    | 2,541              | 5,821   | 0.4                          | 2.5     | 16                  | 48    |
| Motion pictures.....  | 78       | 70                             | 99     | 0       | 0    | 70      | 99     | (D)                | (D)     | (D)                          | 1       | (D)                 | 53    |
| Amusement and recreation services.....                                  | 79       | 42                             | 57     | 0       | 0    | 42      | 57     | 929                | 903     | (D)                          | 1       | (D)                 | 5     |
| Health services.....  | 80       | 845                            | (D)    | 4       | (D)  | 841     | 829    | 13,398             | 13,454  | 7.9                          | 6.8     | 96                  | 113   |
| Legal services.....   | 81       | 2                              | 0      | 0       | 0    | 2       | 0      | (D)                | 0       | (D)                          | 0       | (D)                 | 0     |
| Social services.....  | 83       | 5                              | (D)    | 0       | 0    | 5       | (D)    | (D)                | (D)     | (D)                          | (D)     | (D)                 | (D)   |

See explanatory information and SOURCE at end of table.

Table A-2. Summary data for R&amp;D-performing companies, by detailed industry and size of company: 1996-97

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| Industry and size of company                                      | SIC code | Research and development funds |         |         |           |         |         | Domestic net sales |           | R&D scientists and engineers |           | Domestic employment |        |
|---|----------|--------------------------------|---------|---------|-----------|---------|---------|--------------------|-----------|------------------------------|-----------|---------------------|--------|
|   |          | Total                          |         | Federal |           | Company |         |                    |           | January <sup>3</sup>         | March     | 1996                | 1997   |
|   |          | 1996                           | 1997    | 1996    | 1997      | 1996    | 1997    | 1997               | 1998      | 1996                         | 1997      | 1996                | 1997   |
|   |          | [Dollars in millions]          |         |         |           |         |         |                    |           |                              |           | [In thousands]      |        |
| Distribution by industry:   |          |                                |         |         |           |         |         |                    |           |                              |           |                     |        |
| Museums, art galleries, and botanical and zoological gardens..... | 84       | 0                              | 0       | 0       | 0         | 0       | 0       | 0                  | 0         | 0.0                          | 0.0       | 0                   | 0      |
| Engineering and management services.....                          | 87       | 8,064                          | 9,879   | 3,027   | 3,453 (S) | 5,036   | 6,426   | 76,673             | 56,486    | 50.7                         | 60.2      | 520                 | 344    |
| Miscellaneous services <sup>2</sup> .....                         | 89       | 27                             | (D)     | 7       | (D)       | 20      | 20      | 492                | (D)       | 0.2 (S)                      | 0.2 (S)   | 4                   | 2      |
| Distribution by size of company:<br>[Number of employees]         |          |                                |         |         |           |         |         |                    |           |                              |           |                     |        |
| Total.....  |          | 144,667                        | 157,539 | 23,653  | 23,928    | 121,015 | 133,611 | 4,076,076          | 4,573,376 | 885.7                        | 951.5     | 18,102              | 20,221 |
| Fewer than 500.....   |          | 20,249                         | 24,063  | 2,301   | 2,209     | 17,948  | 21,854  | 339,405            | 383,693   | 177.3                        | 201.8     | 1,831               | 1,975  |
| 500 to 999.....   |          | 4,637                          | 4,966   | 219     | 376       | 4,418   | 4,590   | 147,701            | 164,954   | 37.7                         | 41.3      | 806                 | 790    |
| 1,000 to 4,999.....   |          | 18,273                         | 19,590  | 512     | 540       | 17,761  | 19,049  | 618,426            | 730,532   | 131.6                        | 137.8     | 2,838               | 2,860  |
| 5,000 to 9,999.....   |          | 11,537                         | 14,266  | 468     | 612       | 11,068  | 13,655  | 422,915            | 579,895   | 82.2                         | 100.6     | 2,041               | 2,254  |
| 10,000 to 24,999.....   |          | 20,164                         | 21,510  | 1,031   | 913       | 19,133  | 20,597  | 791,806            | 839,149   | 104.9                        | 116.5     | 2,734               | 3,188  |
| 25,000 or more.....   |          | 69,808                         | 73,144  | 19,122  | 19,277    | 50,686  | 53,866  | 1,755,822          | 1,875,152 | 351.9 (S)                    | 353.5 (S) | 7,852               | 9,154  |

<sup>1</sup> Data for manufacturing industries are shown separately for each two-digit SIC, with the exception of SICs 13 and 29 which are combined. Until 1996, data were not broken down into this level of detail for most nonmanufacturing industries.

<sup>2</sup> Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for companies in these groups are included with their respective SIC classification for this table.

<sup>3</sup> Data recorded in January represent employment figures for the previous year.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-3. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company                     | SIC code      | 1987                  | 1988   | 1989    | 1990    | 1991    | 1992    | 1993    | 1994    | 1995    | 1996    | 1997    |  |
|--|---------------|-----------------------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|
|  |               | [Dollars in millions] |        |         |         |         |         |         |         |         |         |         |  |
| All Industries.....                              |               | 92,155                | 97,015 | 102,055 | 109,727 | 116,952 | 119,110 | 117,400 | 119,595 | 132,103 | 144,667 | 157,539 |  |
| Distribution by industry:                        |               |                       |        |         |         |         |         |         |         |         |         |         |  |
| Manufacturing.....                               |               | 84,311                | 86,503 | 88,024  | 88,934  | 88,506  | 90,177  | 86,569  | 90,749  | 100,067 | 111,864 | 121,025 |  |
| Food, kindred, and tobacco products.....         | 20,21         | 1,206                 | (D)    | (D)     | (D)     | 1,277   | 1,386   | 1,345   | 1,476   | 1,566   | 1,564   | 1,787   |  |
| Textiles and apparel.....                        | 22,23         | (D)                   | (D)    | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     |  |
| Lumber, wood products, and furniture.....        | 24,25         | 137                   | (D)    | 192     | 216     | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     | 348     |  |
| Paper and allied products.....                   | 26            | (D)                   | (D)    | 879     | 1,059   | (D)     |  |
| Chemicals and allied products.....               | 28            | 9,635                 | 11,067 | 12,069  | 13,291  | 14,648  | 15,381  | (D)     | (D)     | 17,547  | (D)     | (D)     |  |
| Industrial chemicals.....                        | 281-82,286    | 3,716                 | 4,172  | 4,451   | 5,010   | 5,390   | 5,165   | (D)     | (D)     | (D)     | (D)     | (D)     |  |
| Drugs and medicines.....                         | 283           | (D)                   | 4,906  | (D)     | (D)     | (D)     | 7,944   | 9,146   | 9,633   | 10,215  | 9,773   | 11,589  |  |
| Other chemicals.....                             | 284-85,28-89  | (D)                   | 1,989  | (D)     | (D)     | (D)     | 2,272   | (D)     | (D)     | (D)     | 2,505   | (D)     |  |
| Petroleum refining and extraction.....           | 13,29         | 1,897                 | 1,997  | 2,180   | 2,306   | 2,498   | 2,277   | 2,152   | 1,950   | 1,760   | 1,654   | (D)     |  |
| Rubber products.....                             | 30            | (D)                   | (D)    | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     |  |
| Stone, clay, and glass products.....             | 32            | 995                   | (D)    | (D)     | (D)     | (D)     | (D)     | 538     | 591     | 448     | 468     | 608     |  |
| Primary metals.....                              | 33            | 730                   | 637    | 686     | 739     | 714     | 522     | 669     | 690     | 593     | (D)     | 988     |  |
| Ferrous metals and products.....                 | 331-32,3398-9 | (D)                   | 253    | (D)     | (D)     | (D)     | (D)     | 289     | (D)     | (D)     | (D)     | (D)     |  |
| Nonferrous metals and products.....              | 333-36        | (D)                   | 384    | (D)     | (D)     | (D)     | 380     | (D)     | (D)     | (D)     | (D)     | (D)     |  |
| Fabricated metal products.....                   | 34            | 783                   | 881    | 904     | 939     | 974     | 1,017   | 1,158   | 1,111   | 1,023   | (D)     | 1,798   |  |
| Machinery.....                                   | 35            | (D)                   | (D)    | (D)     | 14,446  | 14,775  | 14,938  | 8,381   | 8,110   | (D)     | 13,455  | 18,499  |  |
| Office, computing, and accounting machines.....  | 357           | (D)                   | (D)    | (D)     | (D)     | (D)     | (D)     | 4,950   | 4,106   | (D)     | (D)     | 12,840  |  |
| Other machinery, except electrical.....          | 351-56,358-59 | 2,428                 | 2,682  | 2,729   | (D)     | (D)     | (D)     | 3,431   | 4,004   | 5,041   | (D)     | 5,659   |  |
| Electrical equipment.....                        | 36            | 15,848                | 14,128 | 13,318  | 13,400  | 13,415  | 13,360  | 13,349  | 15,338  | 18,751  | 22,498  | 24,585  |  |
| Radio and TV receiving equipment.....            | 365           | 139                   | 149    | 96      | 114     | (D)     |  |
| Communication equipment.....                     | 366           | 10,184                | 8,427  | 7,071   | 5,928   | 4,787   | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     |  |
| Electronic components.....                       | 367           | 4,286                 | 4,133  | 4,025   | 3,914   | (D)     | 3,567   | 5,311   | 6,032   | (D)     | (D)     | (D)     |  |
| Other electrical equipment.....                  | 361-64,369    | 1,239                 | 1,419  | 2,126   | 3,444   | (D)     | (D)     | (D)     | (D)     | (D)     | (D)     | 4,909   |  |
| Transportation equipment.....                    | 37            | 34,246                | 34,775 | 33,859  | 31,361  | 27,428  | 27,494  | 27,258  | 28,087  | 32,441  | 32,737  | 31,993  |  |
| Motor vehicles and motor vehicles equipment..... | 371           | (D)                   | (D)    | (D)     | (D)     | (D)     | (D)     | 11,718  | (D)     | (D)     | (D)     | (D)     |  |
| Other transportation equipment.....              | 373-75,379    | (D)                   | (D)    | (D)     | (D)     | (D)     | (D)     | 483     | (D)     | (D)     | (D)     | (D)     |  |
| Aircraft and missiles.....                       | 372,376       | 24,458                | 24,168 | 22,331  | 20,635  | 16,629  | 17,158  | 15,056  | 14,260  | 16,951  | 16,224  | 16,296  |  |

See explanatory information and SOURCE at end of table.

Table A-3. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company  | SIC code                        | 1987                  | 1988   | 1989   | 1990   | 1991   | 1992   | 1993   | 1994   | 1995   | 1996    | 1997   |  |
|---|---------------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--|
|   |                                 | [Dollars in millions] |        |        |        |        |        |        |        |        |         |        |  |
| Distribution by industry:   |                                 |                       |        |        |        |        |        |        |        |        |         |        |  |
| Professional and scientific instruments.....  | 38                              | 5,222                 | 5,530  | 5,992  | 7,055  | 8,705  | 9,542  | 10,119 | 11,441 | 11,976 | 12,149  | 13,458 |  |
| Scientific and mechanical<br>measuring instruments.....                               | 381-82                          | (D)                   | 1,959  | 2,366  | 3,346  | (D)    | 5,156  | 5,681  | 6,952  | 7,146  | (D)     | 8,135  |  |
| Optical, surgical, photographic, and<br>other instruments.....                        | 384-87                          | (D)                   | 3,571  | 3,626  | 3,709  | (D)    | 4,386  | 4,438  | 4,489  | 4,831  | (D)     | 5,323  |  |
| Other manufacturing industries <sup>1</sup> .....                                     | 27,31,39                        | (D)                   | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)     | 2,798  |  |
| Nonmanufacturing <sup>2</sup> .....   |                                 | 7,844                 | 10,513 | 14,031 | 20,793 | 28,446 | 28,933 | 30,831 | 28,846 | 32,036 | 32,803  | 36,514 |  |
| Transportation and utilities.....   | 40-42,44-49                     | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 5,435  | 4,678   | 3,013  |  |
| Communications.....   | 48                              | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | (D)     | (D)    |  |
| Telephone communications.....   | 481                             | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | (D)     | (D)    |  |
| Other communications.....   | 482-484,489                     | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 59     | 73      | 58     |  |
| Electric, gas, and sanitary services.....   | 49                              | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 440    | 352     | (D)    |  |
| Other transportation and utilities.....   | 40-42,44-47                     | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | (D)     | (D)    |  |
| Trade.....  | 50-59                           | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | 6,389   | (D)    |  |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | (D)     | (D)    |  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 17,876 | 19,022  | 22,400 |  |
| Business services.....  | 73                              | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 9,293  | 10,641  | 11,960 |  |
| Computer and data<br>processing services.....   | 737                             | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 9,059  | (D)     | 11,706 |  |
| Other business services.....  | 731-736,738                     | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 234    | (D)     | 254    |  |
| Health services.....  | 80                              | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 756    | (D)     | (D)    |  |
| Offices and clinics of medical<br>doctors, hospitals, medical<br>and dental labs..... | 801,806,807                     | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | 715 (S) | (D)    |  |
| Other health services.....  | 802-805,808-809                 | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | (D)     | 49     |  |
| Engineering and management<br>services.....   | 87                              | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 7,662  | 7,318   | 9,290  |  |
| Engineering, architectural,<br>and surveying.....                                     | 871                             | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 2,933  | 1,660   | 2,039  |  |
| Research, development, and testing.....   | 873                             | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | 5,484   | (D)    |  |
| Other engineering and<br>management services.....                                     | 872,874                         | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)    | 173     | (D)    |  |

See explanatory information and SOURCE at end of table.

Table A-3. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company                              | SIC code                     | 1987                  | 1988   | 1989    | 1990    | 1991    | 1992    | 1993    | 1994    | 1995    | 1996    | 1997    |  |
|---|------------------------------|-----------------------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|
|   |                              | [Dollars in millions] |        |         |         |         |         |         |         |         |         |         |  |
| Distribution by industry:                                 |                              |                       |        |         |         |         |         |         |         |         |         |         |  |
| Other services.....                                       | 701,72,75-79,<br>81,83,84,89 | NA                    | NA     | NA      | NA      | NA      | NA      | NA      | NA      | 165     | (D)     | (D)     |  |
| Other nonmanufacturing industries <sup>1</sup> .....      | 07-12,14,15,<br>161-162,17   | NA                    | NA     | NA      | NA      | NA      | NA      | NA      | NA      | 413     | (D)     | 1,618   |  |
| Distribution by size of company:<br>[Number of employees] |                              |                       |        |         |         |         |         |         |         |         |         |         |  |
| Total.....  |                              | 92,155                | 97,015 | 102,055 | 109,727 | 116,952 | 119,110 | 117,400 | 119,595 | 132,103 | 144,667 | 157,539 |  |
| Fewer than 500.....                                       |                              | 7,163                 | (S)    | 7,809   | (S)     | 13,172  | 13,557  | 14,620  | 13,966  | 16,662  | 20,249  | 24,063  |  |
| 500 to 999.....   |                              | 1,725                 | 1,669  | 1,825   | 2,154   | 8,000   | 7,958   | 3,230   | 3,608   | 4,693   | 4,637   | 4,966   |  |
| 1,000 to 4,999.....                                       |                              | 7,262                 | 7,622  | 7,881   | 8,411   | 10,453  | 11,886  | 13,334  | 14,617  | 16,960  | 18,273  | 19,590  |  |
| 5,000 to 9,999.....                                       |                              | 4,501                 | 5,245  | 5,756   | 6,746   | 8,049   | 8,258   | 9,135   | 8,912   | 9,532   | 11,537  | 14,266  |  |
| 10,000 to 24,999.....                                     |                              | 12,043                | 11,506 | 10,450  | 12,486  | 15,770  | 15,744  | 15,421  | 15,972  | 17,071  | 20,164  | 21,510  |  |
| 25,000 or more.....                                       |                              | 59,461                | 63,694 | 68,335  | 71,030  | 61,508  | 61,707  | 61,659  | 62,519  | 67,185  | 69,808  | 73,144  |  |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

<sup>2</sup> Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTE:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1997**

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| Industry  | SIC code       | Size of company       |                                |                            |                                |                                |                                  |                                |
|---|----------------|-----------------------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                | Total                 | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                | [Dollars in millions] |                                |                            |                                |                                |                                  |                                |
| All Industries.....                               |                | 157,539               | 24,063                         | 4,966                      | 19,590                         | 14,266                         | 21,510                           | 73,144                         |
| Manufacturing.....                                |                | 121,025               | 8,248                          | 2,905                      | 14,300                         | 11,670                         | 16,874                           | 67,028                         |
| Food, kindred, and tobacco products.....          | 20,21          | 1,787                 | 101                            | 65                         | 265                            | 391                            | 262                              | 703                            |
| Textiles and apparel.....                         | 22,23          | (D)                   | 52                             | 34                         | 106                            | (D)                            | 82                               | (D)                            |
| Lumber, wood products, and furniture.....         | 24,25          | 348                   | 74                             | 22                         | 77                             | 96                             | 79                               | 0                              |
| Paper and allied products.....                    | 26             | (D)                   | 25                             | (D)                        | 140                            | 100                            | 339                              | 889 (S)                        |
| Chemicals and allied products.....                | 28             | (D)                   | 508                            | (D)                        | 3,766                          | 3,200                          | 6,250                            | 5,267                          |
| Industrial chemicals.....                         | 281-82,286     | (D)                   | 89                             | (D)                        | 1,192                          | 646                            | 2,229                            | (D)                            |
| Drugs and medicines.....                          | 283            | 11,589                | 234                            | 54                         | 2,047                          | 2,207                          | 3,737                            | 3,311                          |
| Other chemicals.....                              | 284-85,287-89  | (D)                   | 185                            | 59                         | 528                            | 347                            | 284                              | (D)                            |
| Petroleum refining and extraction.....            | 13,29          | (D)                   | 6                              | (D)                        | 80                             | (D)                            | 729                              | 790                            |
| Rubber products.....                              | 30             | (D)                   | 165                            | 113                        | 413                            | 120                            | 243 (S)                          | (D)                            |
| Stone, clay, and glass products.....              | 32             | 608                   | 16                             | 31                         | 72                             | 103                            | 386                              | 0                              |
| Primary metals.....                               | 33             | 988                   | 47                             | 22                         | 146                            | 233                            | (D)                              | (D)                            |
| Ferrous metals and products.....                  | 331-32,3398-99 | (D)                   | 8                              | (D)                        | 55                             | 197                            | 335                              | (D)                            |
| Nonferrous metals and products.....               | 333-36         | (D)                   | 39                             | (D)                        | 91                             | 37                             | (D)                              | (D)                            |
| Fabricated metal products.....                    | 34             | 1,798                 | 451                            | (D)                        | 205                            | 189                            | 455                              | (D)                            |
| Machinery.....                                    | 35             | 18,499                | 1,775                          | 586                        | 2,609                          | 1,954                          | 4,155                            | 7,421                          |
| Office, computing, and<br>accounting machines.... | 357            | 12,840                | 830                            | (D)                        | 1,375                          | 904                            | 2,952                            | (D)                            |
| Other machinery, except electrical.....           | 351-56,358-59  | 5,659                 | 945                            | (D)                        | 1,234                          | 1,051                          | 1,203                            | (D)                            |
| Electrical equipment.....                         | 36             | 24,585                | 1,789                          | 854                        | 3,628                          | 3,114                          | 1,953                            | 13,248                         |
| Radio and TV receiving equipment.....             | 365            | (D)                   | 23                             | (D)                        | 124                            | 0                              | 0                                | (D)                            |
| Communication equipment.....                      | 366            | (D)                   | 520                            | (D)                        | 937                            | 1,418                          | 0                                | 4,848                          |
| Electronic components.....                        | 367            | (D)                   | 972                            | (D)                        | 1,913                          | 1,427                          | 1,668                            | (D)                            |
| Other electrical equipment.....                   | 361-64,369     | 4,909                 | 273                            | (D)                        | 654                            | 270                            | 285                              | (D)                            |

See explanatory information and SOURCE at end of table.

Table A-4. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company: 1997

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| Industry   | SIC code                        | Size of company       |                                |                            |                                |                                |                                  |                                |
|--|---------------------------------|-----------------------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                                 | Total                 | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                                 | [Dollars in millions] |                                |                            |                                |                                |                                  |                                |
| Transportation equipment.....                                  | 37                              | 31,993                | 64                             | 166                        | 288                            | 846                            | 762                              | 29,868                         |
| Motor vehicles and motor<br>vehicles equipment.....            | 371                             | (D)                   | 50                             | 111                        | 87                             | (D)                            | 536                              | (D)                            |
| Other transportation equipment.....                            | 373-75,379                      | (D)                   | (D)                            | (D)                        | 29                             | (D)                            | (D)                              | (D)                            |
| Aircraft and missiles.....                                     | 372,376                         | 16,296                | (D)                            | (D)                        | 173                            | 599                            | (D)                              | 15,331                         |
| Professional and scientific instruments.....                   | 38                              | 13,458                | 1,109                          | 686                        | 2,300                          | 989                            | 652                              | 7,722                          |
| Scientific and mechanical<br>measuring instruments....         | 381-82                          | 8,135                 | 785                            | 485                        | 955                            | 375                            | (D)                              | (D)                            |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87                          | 5,323                 | 324                            | 201                        | 1,345                          | 614                            | (D)                              | (D)                            |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39                        | 2,798                 | 2,066                          | (D)                        | 206                            | 309                            | (D)                              | 32                             |
| Nonmanufacturing.....  |                                 | 36,514                | 15,815                         | 2,061                      | 5,289                          | 2,596                          | 4,636                            | 6,116                          |
| Transportation and utilities.....                              | 40-42,44-49                     | 3,013                 | 56                             | 22                         | 138                            | 70                             | 128                              | 2,598                          |
| Communications.....  | 48                              | (D)                   | 17                             | (D)                        | 20                             | (D)                            | 0                                | (D)                            |
| Telephone communications.....                                  | 481                             | (D)                   | 0                              | (D)                        | 0                              | (D)                            | 0                                | 1,963                          |
| Other communications.....                                      | 482-484,489                     | 58                    | 17                             | (D)                        | 20                             | 0                              | 0                                | (D)                            |
| Electric, gas, and sanitary services.....                      | 49                              | (D)                   | 15                             | (D)                        | 97                             | 36                             | (D)                              | (D)                            |
| Other transportation and utilities.....                        | 40-42,44-47                     | (D)                   | 24                             | (D)                        | 22 (S)                         | (D)                            | (D)                              | 625                            |
| Trade.....   | 50-59                           | (D)                   | 3,030                          | (D)                        | 1,576                          | 789                            | (D)                              | 1,316                          |
| Finance, insurance, and real estate.....                       | 60-65,67                        | (D)                   | 340                            | (D)                        | 253                            | 332                            | (D)                              | 266                            |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 22,400                | 11,074                         | (D)                        | 3,252                          | 1,344                          | 3,205                            | (D)                            |
| Business services.....   | 73                              | 11,960                | 4,235                          | (D)                        | 2,900                          | 1,286                          | (D)                              | 358 (S)                        |
| Computer and data<br>processing services.....                  | 737                             | 11,706                | 4,206                          | 775                        | 2,832                          | 1,276                          | (D)                              | (D)                            |
| Other business services.....                                   | 731-736,738                     | 254                   | 29                             | (D)                        | 67                             | 10                             | (D)                              | (D)                            |

See explanatory information and SOURCE at end of table.

Table A-4. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company: 1997

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| Industry  | SIC code                  | Size of company       |                                |                            |                                |                                |                                  |                                |
|---|---------------------------|-----------------------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                           | Total                 | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                           | [Dollars in millions] |                                |                            |                                |                                |                                  |                                |
| Health services.....  | 80                        | (D)                   | 77                             | (D)                        | 43                             | 0                              | (D)                              | 0                              |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807               | (D)                   | 64                             | (D)                        | 8 (S)                          | 0                              | (D)                              | 0                              |
| Other health services.....  | 802-805,808-809           | 49                    | 13                             | 0                          | 36                             | 0                              | 0                                | 0                              |
| Engineering and management services....   | 87                        | 9,290                 | 6,465                          | 887                        | 265 (S)                        | (D)                            | (D)                              | (D)                            |
| Engineering, architectural, and surveying.....                                  | 871                       | 2,039                 | 1,390                          | 203                        | 241 (S)                        | (D)                            | (D)                              | 0                              |
| Research, development, and testing.....   | 873                       | (D)                   | 4,820                          | 644                        | (D)                            | 0                              | 0                                | (D)                            |
| Other engineering and management services.....                                  | 872,874                   | (D)                   | 254                            | 41                         | (D)                            | (D)                            | (D)                              | 0                              |
| Other services.....   | 701,72,75-79,81, 83,84,89 | (D)                   | 297                            | 49                         | 45                             | (D)                            | (D)                              | 0                              |
| Other nonmanufacturing industries <sup>1</sup> .....                            | 07-12,14,15, 161-162,17   | 1,618                 | 1,315                          | 10                         | 71                             | 62                             | (D)                              | (D)                            |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-5. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry, size of company, and size of R&amp;D program: 1997

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| Industry and size of company                    | SIC code       | Total   | Size of R&D program   |                        |                               |                                 |                       |
|---|----------------|---------|-----------------------|------------------------|-------------------------------|---------------------------------|-----------------------|
|   |                |         | Less than \$200,000   | \$200,000 to \$999,999 | \$ 1 million to \$9.9 million | \$ 10 million to \$99.9 million | \$100 million or more |
|   |                |         | [Dollars in millions] |                        |                               |                                 |                       |
| All Industries.....                             |                | 157,539 | 1,131                 | 4,427                  | 15,629                        | 29,613                          | 106,738               |
| Distribution by industry:                       |                |         |                       |                        |                               |                                 |                       |
| Manufacturing.....                              |                | 121,025 | 638                   | 2,190                  | 7,753                         | 16,959                          | 93,485                |
| Food, kindred, and tobacco products.....        | 20,21          | 1,787   | (D)                   | 103                    | 306                           | 842                             | (D)                   |
| Textiles and apparel.....                       | 22,23          | (D)     | (D)                   | 28                     | 127                           | 147                             | (D)                   |
| Lumber, wood products, and furniture.....       | 24,25          | 348     | 10                    | 64                     | 75                            | 199                             | 0                     |
| Paper and allied products.....                  | 26             | (D)     | 2                     | 5                      | 139                           | 502                             | (D)                   |
| Chemicals and allied products.....              | 28             | (D)     | (D)                   | 100                    | 481                           | 2,732                           | 15,854                |
| Industrial chemicals.....                       | 281-82,286     | (D)     | (D)                   | 4                      | 169                           | 1,181                           | 4,138                 |
| Drugs and medicines.....                        | 283            | 11,589  | 5                     | 73                     | 45                            | 740                             | 10,726                |
| Other chemicals.....                            | 284-285,287-89 | (D)     | (D)                   | 23                     | 267                           | 811                             | 991                   |
| Petroleum refining and extraction.....          | 13,29          | (D)     | (D)                   | 0                      | 53                            | 218                             | 1,349                 |
| Rubber products.....                            | 30             | (D)     | 28                    | 105                    | 332                           | 536                             | (D)                   |
| Stone, clay, and glass products.....            | 32             | 608     | (D)                   | 5                      | 71                            | 273                             | (D)                   |
| Primary metals.....                             | 33             | 988     | (D)                   | 19                     | 161                           | 427                             | (D)                   |
| Ferrous metals and products.....                | 331-32,3398-99 | (D)     | (D)                   | 10                     | 78                            | 293                             | (D)                   |
| Nonferrous metals and products.....             | 333-36         | (D)     | (D)                   | 9                      | 82                            | 134                             | (D)                   |
| Fabricated metal products.....                  | 34             | 1,798   | (D)                   | 193                    | 554                           | 504                             | (D)                   |
| Machinery.....                                  | 35             | 18,499  | 38                    | 240                    | 1,617                         | 2,781                           | 13,823                |
| Office, computing, and accounting machines..... | 357            | 12,840  | (D)                   | (D)                    | 403                           | 1,094                           | 11,343                |
| Other machinery, except electrical.....         | 351-56,358-59  | 5,659   | (D)                   | (D)                    | 1,214                         | 1,687                           | 2,481                 |
| Electrical equipment.....                       | 36             | 24,585  | 27                    | 268                    | 1,589                         | 3,931                           | 18,771                |
| Radio and TV receiving equipment.....           | 365            | (D)     | 0                     | (D)                    | 30                            | 124                             | 0                     |
| Communication equipment.....                    | 366            | (D)     | 8                     | (D)                    | 293                           | 1,526                           | 6,142                 |
| Electronic components.....                      | 367            | (D)     | 14                    | (D)                    | 772                           | 1,476                           | 9,081                 |
| Other electrical equipment.....                 | 361-64,369     | 4,909   | 6                     | 55                     | 495                           | 806                             | 3,548                 |

See explanatory information and SOURCE at end of table.

Table A-5. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry, size of company, and size of R&amp;D program: 1997

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| Industry and size of company                                | SIC code                    | Total  | Size of R&D program   |                        |                              |                                |                       |
|---|-----------------------------|--------|-----------------------|------------------------|------------------------------|--------------------------------|-----------------------|
|   |                             |        | Less than \$200,000   | \$200,000 to \$999,999 | \$1 million to \$9.9 million | \$10 million to \$99.9 million | \$100 million or more |
|   |                             |        | [Dollars in millions] |                        |                              |                                |                       |
| Distribution by industry:                                   |                             |        |                       |                        |                              |                                |                       |
| Transportation equipment.....                               | 37                          | 31,993 | 6                     | 44                     | 223                          | 908                            | 30,812                |
| Motor vehicles and motor vehicles equipment.....            | 371                         | (D)    | (D)                   | 44                     | 144                          | 551                            | (D)                   |
| Other transportation equipment.....                         | 373-75,379                  | (D)    | (D)                   | 0                      | 25                           | 168                            | (D)                   |
| Aircraft and missiles.....                                  | 372,376                     | 16,296 | 0                     | 0                      | 54                           | 189                            | 16,053                |
| Professional and scientific instruments.....                | 38                          | 13,458 | 6                     | 112                    | 1,133                        | 2,481                          | 9,725                 |
| Scientific and mechanical measuring instruments.....        | 381-82                      | 8,135  | 5                     | 88                     | 683                          | 1,348                          | 6,012                 |
| Optical, surgical, photographic, and other instruments..... | 384-87                      | 5,323  | 2                     | 25                     | 450                          | 1,133                          | 3,713                 |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                    | 2,798  | (D)                   | 904                    | 891                          | 479                            | (D)                   |
| Nonmanufacturing .....                                      |                             | 36,514 | 493                   | 2,237                  | 7,877                        | 12,653                         | 13,254                |
| Transportation and utilities.....                           | 40-42,44-49                 | 3,013  | 5                     | 49                     | 652                          | 473                            | 1,835                 |
| Communications.....   | 48                          | (D)    | (D)                   | 12                     | 32                           | (D)                            | 1,711                 |
| Telephone communications.....                               | 481                         | (D)    | 0                     | 0                      | 0                            | 276                            | 1,711                 |
| Other communications.....                                   | 482-484,489                 | 58     | (D)                   | 12                     | 32                           | (D)                            | 0                     |
| Electric, gas, and sanitary services.....                   | 49                          | (D)    | (D)                   | 17                     | 135                          | 130                            | (D)                   |
| Other transportation and utilities.....                     | 40-42,44-47                 | (D)    | 2                     | 20                     | 486                          | (D)                            | (D)                   |
| Trade.....  | 50-59                       | (D)    | (D)                   | 406                    | 835                          | 3,594                          | 3,009                 |
| Finance, insurance, and real estate.....                    | 60-65,67                    | (D)    | (D)                   | 27                     | 439                          | 439                            | (D)                   |
| Services.....   | 701,72,73,75-81,83,84,87,89 | 22,400 | 97                    | 726                    | 5,852                        | 8,062                          | 7,662                 |
| Business services.....                                      | 73                          | 11,960 | 33                    | 452                    | 3,071                        | 3,494                          | 4,909                 |
| Computer and data processing services.....                  | 737                         | 11,706 | 28                    | 437                    | 2,987                        | 3,344                          | 4,909                 |
| Other business services.....                                | 731-736,738                 | 254    | 5                     | 15                     | 84                           | 150                            | 0                     |

See explanatory information and SOURCE at end of table.

Table A-5. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry, size of company, and size of R&amp;D program: 1997

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| Industry and size of company   | SIC code                     | Total   | Size of R&D program   |                        |                              |                                |                       |
|--|------------------------------|---------|-----------------------|------------------------|------------------------------|--------------------------------|-----------------------|
|  |                              |         | Less than \$200,000   | \$200,000 to \$999,999 | \$1 million to \$9.9 million | \$10 million to \$99.9 million | \$100 million or more |
|  |                              |         | [Dollars in millions] |                        |                              |                                |                       |
| Distribution by industry:  |                              |         |                       |                        |                              |                                |                       |
| Health services.....   | 80                           | (D)     | 34                    | 12                     | 38                           | (D)                            | (D)                   |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                  | (D)     | 34                    | 2                      | 29                           | (D)                            | (D)                   |
| Other health services.....   | 802-805,808-809              | 49      | 0                     | 10                     | 9 (S)                        | (D)                            | 0                     |
| Engineering and management services.....   | 87                           | 9,290   | (D)                   | 162                    | 2,495                        | 4,412                          | (D)                   |
| Engineering, architectural, and<br>surveying.....                                  | 871                          | 2,039   | (D)                   | 94                     | 794                          | 971                            | (D)                   |
| Research, development, and testing.....  | 873                          | (D)     | (D)                   | 62                     | 1,534                        | 3,258                          | 2,029 (S)             |
| Other engineering and<br>management services .....                                 | 872,874                      | (D)     | (D)                   | 7                      | 167                          | 183                            | 0                     |
| Other services.....  | 701,72,75-79,81,<br>83,84,89 | (D)     | (D)                   | 99                     | 248                          | (D)                            | 0                     |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17   | 1,618   | (D)                   | 1,029                  | 99                           | 86                             | (D)                   |
| Distribution by size of company:<br>[Number of employees]                          |                              |         |                       |                        |                              |                                |                       |
| Total.....   |                              | 157,539 | 1,131                 | 4,427                  | 15,629                       | 29,613                         | 106,738               |
| Fewer than 500.....  |                              | 24,063  | (D)                   | 4,131                  | 10,841                       | 7,878                          | (D)                   |
| 500 to 999.....  |                              | 4,966   | 23                    | 176                    | 1,553                        | 2,722                          | 493                   |
| 1,000 to 4,999.....  |                              | 19,590  | 12                    | 102                    | 2,142                        | 10,075                         | 7,259                 |
| 5,000 to 9,999.....  |                              | 14,266  | 0                     | 12                     | 327                          | 4,533                          | 9,395                 |
| 10,000 to 24,999.....  |                              | 21,510  | 0                     | 3                      | 222                          | 2,871                          | 18,414                |
| 25,000 or more.....  |                              | 73,144  | (D)                   | 5                      | 545                          | 1,533                          | (D)                   |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-6. Number of R&amp;D-performing companies, by industry, size of company, and size of R&amp;D program: 1997

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| Industry and size of company                    | SIC code       | Total  | Size of R&D program   |                        |                               |                                 |                       |
|---|----------------|--------|-----------------------|------------------------|-------------------------------|---------------------------------|-----------------------|
|   |                |        | Less than \$200,000   | \$200,000 to \$999,999 | \$ 1 million to \$9.9 million | \$ 10 million to \$99.9 million | \$100 million or more |
|   |                |        | [Number of companies] |                        |                               |                                 |                       |
| All Industries.....                             |                | 35,112 | 19,195                | 9,530                  | 5,065                         | 1,131                           | 190                   |
| Distribution by industry:                       |                |        |                       |                        |                               |                                 |                       |
| Manufacturing.....                              |                | 18,130 | 10,005                | 4,630                  | 2,736                         | 609                             | 149                   |
| Food, kindred, and tobacco product .....        | 20,21          | 696    | 397                   | 167                    | 104                           | 26                              | 2                     |
| Textiles and apparel.....                       | 22,23          | 278    | 148                   | 76                     | 45                            | 8                               | 1                     |
| Lumber, wood products, and furniture.....       | 24,25          | 257    | 129                   | 96                     | 24                            | 8                               | 0                     |
| Paper and allied products.....                  | 26             | 121    | 53                    | 9                      | 41                            | 17                              | 2                     |
| Chemicals and allied products.....              | 28             | 602    | 148                   | 160                    | 174                           | 86                              | 35                    |
| Industrial chemicals.....                       | 281-82,286     | 161    | 50                    | 5                      | 59                            | 35                              | 12                    |
| Drugs and medicines.....                        | 283            | 199    | 50                    | 100                    | 6                             | 23                              | 20                    |
| Other chemicals.....                            | 284-85,287-89  | 242    | 48                    | 55                     | 108                           | 28                              | 3                     |
| Petroleum refining and extraction.....          | 13,29          | 26     | 0                     | 0                      | 13                            | 7                               | 6                     |
| Rubber products.....                            | 30             | 639    | 313                   | 203                    | 100                           | 21                              | 2                     |
| Stone, clay, and glass products.....            | 32             | 98     | 50                    | 12                     | 24                            | 9                               | 2                     |
| Primary metals.....                             | 33             | 250    | 150                   | 30                     | 47                            | 22                              | 2                     |
| Ferrous metals and products.....                | 331-32,3398-99 | 54     | 0                     | 19                     | 20                            | 15                              | 1                     |
| Nonferrous metals and products.....             | 333-36         | 196    | 150                   | 11                     | 27                            | 7                               | 1                     |
| Fabricated metal products.....                  | 34             | 903    | 254                   | 423                    | 209                           | 15                              | 2                     |
| Machinery.....                                  | 35             | 1,536  | 473                   | 477                    | 444                           | 118                             | 25                    |
| Office, computing, and accounting machines..... | 357            | 119    | 0                     | 1                      | 50                            | 53                              | 15                    |
| Other machinery, except electrical.....         | 351-56,358-59  | 1,417  | 473                   | 476                    | 394                           | 65                              | 10                    |
| Electrical equipment.....                       | 36             | 1,547  | 324                   | 501                    | 546                           | 143                             | 34                    |
| Radio and TV receiving equipment.....           | 365            | 19     | 0                     | 4                      | 12                            | 3                               | 0                     |
| Communication equipment.....                    | 366            | 322    | 50                    | 129                    | 83                            | 50                              | 10                    |
| Electronic components.....                      | 367            | 748    | 129                   | 249                    | 297                           | 56                              | 17                    |
| Other electrical equipment.....                 | 361-64,369     | 460    | 145                   | 120                    | 154                           | 34                              | 7                     |

See explanatory information and SOURCE at end of table.

Table A-6. Number of R&amp;D-performing companies, by industry, size of company, and size of R&amp;D program: 1997

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| Industry and size of company                                | SIC code                        | Total  | Size of R&D program   |                        |                               |                                 |                       |
|---|---------------------------------|--------|-----------------------|------------------------|-------------------------------|---------------------------------|-----------------------|
|   |                                 |        | Less than \$200,000   | \$200,000 to \$999,999 | \$ 1 million to \$9.9 million | \$ 10 million to \$99.9 million | \$100 million or more |
|   |                                 |        | [Number of companies] |                        |                               |                                 |                       |
| Distribution by industry:                                   |                                 |        |                       |                        |                               |                                 |                       |
| Transportation equipment.....                               | 37                              | 411    | 200                   | 100                    | 66                            | 27                              | 18                    |
| Motor vehicles and motor vehicles equipment .....           | 371                             | 377    | 200                   | 100                    | 55                            | 17                              | 5                     |
| Other transportation equipment.....                         | 373-75,379                      | 10     | 0                     | 0                      | 4                             | 4                               | 2                     |
| Aircraft and missiles.....                                  | 372,376                         | 24     | 0                     | 0                      | 7                             | 6                               | 11                    |
| Professional and scientific instruments.....                | 38                              | 760    | 96                    | 206                    | 357                           | 85                              | 17                    |
| Scientific and mechanical measuring instruments .....       | 381-82                          | 515    | 77                    | 153                    | 226                           | 51                              | 8                     |
| Optical, surgical, photographic, and other instruments..... | 384-87                          | 246    | 19                    | 53                     | 131                           | 34                              | 9                     |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                        | 10,005 | 7,273                 | 2,171                  | 543                           | 18                              | 1                     |
| Nonmanufacturing .....                                      |                                 | 16,982 | 9,190                 | 4,900                  | 2,329                         | 522                             | 41                    |
| Transportation and utilities.....                           | 40-42,44-49                     | 417    | 180                   | 117                    | 102                           | 14                              | 4                     |
| Communications.....   | 48                              | 90     | 52                    | 21                     | 7                             | 7                               | 3                     |
| Telephone communications.....                               | 481                             | 59     | 50                    | 0                      | 0                             | 6                               | 3                     |
| Other communications.....                                   | 482-484,489                     | 31     | 2                     | 21                     | 7                             | 1                               | 0                     |
| Electric, gas, and sanitary services.....                   | 49                              | 161    | 77                    | 44                     | 35                            | 5                               | 0                     |
| Other transportation and utilities.....                     | 40-42,44-47                     | 166    | 51                    | 52                     | 60                            | 2                               | 1                     |
| Trade.....  | 50-59                           | 3,713  | 2,286                 | 924                    | 345                           | 148                             | 9                     |
| Finance, insurance, and real estate.....                    | 60-65,67                        | 382    | 199                   | 58                     | 101                           | 20                              | 4                     |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 4,891  | 1,411                 | 1,379                  | 1,745                         | 334                             | 23                    |
| Business services.....                                      | 73                              | 2,455  | 484                   | 838                    | 978                           | 138                             | 16                    |
| Computer and data processing services.....                  | 737                             | 2,273  | 367                   | 803                    | 956                           | 132                             | 16                    |
| Other business services.....                                | 731-736,738                     | 181    | 118                   | 35                     | 23                            | 6                               | 0                     |

See explanatory information and SOURCE at end of table.

Table A-6. Number of R&amp;D-performing companies, by industry, size of company, and size of R&amp;D program: 1997

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| Industry and size of company   | SIC code                     | Total  | Size of R&D program   |                        |                               |                                 |                       |
|--|------------------------------|--------|-----------------------|------------------------|-------------------------------|---------------------------------|-----------------------|
|  |                              |        | Less than \$200,000   | \$200,000 to \$999,999 | \$ 1 million to \$9.9 million | \$ 10 million to \$99.9 million | \$100 million or more |
|  |                              |        | [Number of companies] |                        |                               |                                 |                       |
| <b>Distribution by industry:</b>   |                              |        |                       |                        |                               |                                 |                       |
| Health services.....   | 80                           | 483    | 410                   | 56                     | 13                            | 3                               | 1                     |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                  | 427    | 410                   | 6                      | 9                             | 1                               | 1                     |
| Other health services.....   | 802-805,808-809              | 56     | 0                     | 50                     | 4                             | 2                               | 0                     |
| Engineering and management services.....   | 87                           | 1,569  | 351                   | 331                    | 691                           | 190                             | 6                     |
| Engineering, architectural, and surveying.....                                     | 871                          | 697    | 201                   | 195                    | 262                           | 38                              | 1                     |
| Research, development, and testing.....  | 873                          | 727    | 63                    | 119                    | 397                           | 144                             | 5                     |
| Other engineering and management<br>services.. ..                                  | 872,874                      | 145    | 87                    | 18                     | 32                            | 8                               | 0                     |
| Other services.....  | 701,72,75-79,81,<br>83,84,89 | 385    | 166                   | 154                    | 62                            | 3                               | 0                     |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17   | 7,579  | 5,114                 | 2,422                  | 36                            | 6                               | 1                     |
| <b>Distribution by size of company:</b>  |                              |        |                       |                        |                               |                                 |                       |
| [Number of employees]  |                              |        |                       |                        |                               |                                 |                       |
| Total.....   |                              | 35,112 | 19,195                | 9,530                  | 5,065                         | 1,131                           | 190                   |
| Fewer than 500.....  |                              | 31,995 | 18,732                | 8,996                  | 3,838                         | 427                             | 1                     |
| 500 to 999.....  |                              | 1,127  | 213                   | 320                    | 468                           | 124                             | 3                     |
| 1,000 to 4,999.....  |                              | 1,302  | 184                   | 185                    | 566                           | 324                             | 43                    |
| 5,000 to 9,999.....  |                              | 322    | 50                    | 20                     | 71                            | 142                             | 39                    |
| 10,000 to 24,999.....  |                              | 199    | 15                    | 3                      | 56                            | 77                              | 49                    |
| 25,000 or more.....  |                              | 167    | 1                     | 6                      | 67                            | 38                              | 55                    |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-7. Company and other (except Federal) funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company                     | SIC code       | 1987                  | 1988   | 1989   | 1990   | 1991   | 1992   | 1993   | 1994   | 1995    | 1996    | 1997    |  |
|--|----------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|--|
|  |                | [Dollars in millions] |        |        |        |        |        |        |        |         |         |         |  |
| All Industries.....                              |                | 61,403                | 66,672 | 73,501 | 81,602 | 90,580 | 94,388 | 94,591 | 97,131 | 108,652 | 121,015 | 133,611 |  |
| Distribution by industry:                        |                |                       |        |        |        |        |        |        |        |         |         |         |  |
| Manufacturing.....                               |                | 56,259                | 59,415 | 63,199 | 65,251 | 67,639 | 71,025 | 69,901 | 73,375 | 81,236  | 91,845  | 101,202 |  |
| Food, kindred, and tobacco products.....         | 20,21          | 1,204                 | 1,173  | 1,244  | 1,248  | 1,277  | 1,386  | 1,345  | 1,476  | 1,566   | 1,564   | 1,787   |  |
| Textiles and apparel.....                        | 22,23          | 243                   | 215    | (S)    | 260    | 236    | 261    | 286    | 316    | 381     | 414     | 476     |  |
| Lumber, wood products, and furniture.....        | 24,25          | 137                   | 165    | 192    | 216    | 200    | 234    | 196    | 201    | 229     | 634     | 348     |  |
| Paper and allied products.....                   | 26             | 604                   | 752    | 879    | 1,059  | 1,174  | 1,182  | 1,191  | 1,263  | 1,404   | 1,534   | 1,456   |  |
| Chemicals and allied products.....               | 28             | 9,445                 | 10,828 | 11,943 | 13,168 | 14,439 | 15,091 | 16,658 | 16,559 | 17,337  | 17,520  | 18,628  |  |
| Industrial chemicals.....                        | 281-82,286     | 3,531                 | 3,939  | 4,340  | 4,902  | 5,225  | 4,911  | 5,165  | 4,780  | 5,139   | 5,246   | 4,970   |  |
| Drugs and medicines.....                         | 283            | 4,095                 | 4,900  | 5,512  | 5,917  | 6,947  | 7,934  | 9,132  | 9,625  | 10,202  | 9,769   | 11,586  |  |
| Other chemicals.....                             | 284-85,287-89  | 1,819                 | 1,989  | 2,091  | 2,349  | 2,267  | 2,246  | 2,361  | 2,154  | 1,996   | 2,505   | 2,072   |  |
| Petroleum refining and extraction.....           | 13,29          | 1,883                 | 1,975  | 2,162  | 2,289  | 2,487  | 2,268  | 2,138  | 1,939  | 1,754   | 1,630   | 1,612   |  |
| Rubber products.....                             | 30             | 596                   | 718    | 867    | 1,056  | (D)    | 1,256  | 1,059  | 1,432  | 1,210   | 1,269   | 1,372   |  |
| Stone, clay, and glass products.....             | 32             | 985                   | 697    | 615    | 538    | 455    | 479    | 529    | 553    | 441     | 463     | 606     |  |
| Primary metals.....                              | 33             | 711                   | 620    | 666    | 717    | 706    | 514    | 646    | 672    | 580     | 637     | 767     |  |
| Ferrous metals and products.....                 | 331-32,3398-99 | 249                   | 252    | 244    | 231    | 225    | 221    | 272    | 241    | 217     | 214     | 414     |  |
| Nonferrous metals and products.....              | 333-36         | 462                   | 368    | 422    | 486    | 481    | 293    | 374    | 431    | 363     | 422     | 353     |  |
| Fabricated metal products.....                   | 34             | 633                   | 718    | 726    | 736    | 748    | 723    | 936    | 868    | 937     | 1,322   | 1,669   |  |
| Machinery.....                                   | 35             | 10,577                | 11,929 | 13,342 | 13,575 | 13,720 | 13,903 | 8,295  | 8,011  | 9,676   | 13,338  | 18,393  |  |
| Office, computing, and accounting machines.....  | 357            | 8,193                 | 9,347  | 10,725 | 10,988 | 10,419 | 10,614 | 4,917  | 4,078  | 4,699   | 8,132   | 12,787  |  |
| Other machinery, except electrical.....          | 351-56,358-59  | 2,384                 | 2,582  | 2,618  | 2,587  | 3,301  | 3,289  | 3,378  | 3,933  | 4,976   | 5,206   | 5,606   |  |
| Electrical equipment.....                        | 36             | 10,449                | 9,975  | 9,575  | 9,267  | 8,865  | 9,516  | 11,682 | 13,537 | 17,060  | 20,356  | 22,747  |  |
| Radio and TV receiving equipment.....            | 365            | 139                   | 149    | 96     | 114    | (D)    | 93     | 87     | 64     | 114     | 140     | 152     |  |
| Communication equipment.....                     | 366            | 5,455                 | 4,798  | 4,159  | 3,584  | (S)    | 3,381  | 3,954  | 4,939  | 3,845   | 4,359   | 7,377   |  |
| Electronic components.....                       | 367            | 3,630                 | 3,684  | 3,655  | 3,496  | 3,177  | 3,320  | 5,105  | 5,870  | 9,628   | 12,497  | 10,786  |  |
| Other electrical equipment.....                  | 361-64,369     | 1,225                 | 1,345  | 1,664  | 2,073  | (D)    | 2,722  | 2,537  | 2,664  | 3,473   | 3,360   | 4,432   |  |
| Transportation equipment.....                    | 37             | 13,462                | 13,910 | 14,596 | 14,264 | 14,858 | 16,292 | 16,640 | 17,695 | 19,311  | 20,535  | 19,742  |  |
| Motor vehicles and motor vehicles equipment..... | 371            | 7,167                 | 7,783  | 8,756  | 8,594  | 9,063  | 9,132  | 10,659 | 11,950 | 13,590  | 14,528  | 13,758  |  |
| Other transportation equipment.....              | 373-75,379     | 356                   | 361    | 337    | 283    | 262    | 289    | 297    | 279    | 232     | 298     | 307     |  |
| Aircraft and missiles.....                       | 372,376        | 5,939                 | 5,766  | 5,503  | 5,387  | 5,533  | 6,871  | 5,684  | 5,466  | 5,489   | 5,710   | 5,677   |  |

See explanatory information and SOURCE at end of table

Table A-7. Company and other (except Federal) funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company  | SIC code                        | 1987                  | 1988  | 1989   | 1990   | 1991   | 1992   | 1993   | 1994   | 1995   | 1996   | 1997   |  |
|---|---------------------------------|-----------------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
|   |                                 | [Dollars in millions] |       |        |        |        |        |        |        |        |        |        |  |
| Distribution by industry:   |                                 |                       |       |        |        |        |        |        |        |        |        |        |  |
| Professional and scientific instruments.....                                    | 38                              | 4,950                 | 5,339 | 5,729  | 6,318  | 6,840  | 7,321  | 7,542  | 8,058  | 8,516  | 8,207  | 8,958  |  |
| Scientific and mechanical measuring instruments...                              | 381-82                          | 1,598                 | 1,863 | 2,205  | 2,696  | 3,017  | 3,013  | 3,196  | 3,687  | 3,787  | 3,283  | 3,719  |  |
| Optical, surgical, photographic, and other instruments.....                     | 384-87                          | 3,352                 | 3,476 | 3,524  | 3,621  | 3,823  | 4,308  | 4,346  | 4,371  | 4,729  | 4,924  | 5,240  |  |
| Other manufacturing industries <sup>1</sup> .....                               | 27,31,39                        | 380                   | 401   | 438    | 541    | (D)    | 599    | 758    | 796    | 835    | 2,423  | 2,642  |  |
| Nonmanufacturing <sup>2</sup> .....   |                                 | 5,144                 | 7,257 | 10,302 | 16,351 | 22,941 | 23,363 | 24,690 | 23,756 | 27,415 | 29,170 | 32,409 |  |
| Transportation and utilities.....   | 40-42,44-49                     | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 5,183  | 4,492  | 2,812  |  |
| Communications.....   | 48                              | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 4,756  | 3,970  | 1,884  |  |
| Telephone communications.....   | 481                             | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 4,697  | 3,897  | 1,826  |  |
| Other communications.....   | 482-484,489                     | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 59     | 73     | 58     |  |
| Electric, gas, and sanitary services.....                                       | 49                              | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 347    | 311    | 258    |  |
| Other transportation and utilities.....   | 40-42,44-47                     | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 80     | 211    | 670    |  |
| Trade.....  | 50-59                           | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 7,514  | 6,338  | 7,961  |  |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 710    | 1,280  | 1,500  |  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 13,606 | 15,904 | 18,594 |  |
| Business services.....  | 73                              | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 8,681  | 10,280 | 11,560 |  |
| Computer and data processing services.....                                      | 737                             | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 8,545  | 10,025 | 11,318 |  |
| Other business services.....  | 731-736,738                     | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 136    | 255    | 242    |  |
| Health services.....  | 80                              | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 753    | 735    | 679    |  |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 737    | 713    | (D)    |  |
| Other health services.....  | 802-805,808-809                 | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 16     | 23     | (D)    |  |
| Engineering and management services.....  | 87                              | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 4,011  | 4,572  | 5,909  |  |
| Engineering, architectural, and surveying.....                                  | 871                             | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 1,050  | 667    | 781    |  |
| Research, development, and testing.....   | 873                             | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 2,829  | 3,776  | 4,782  |  |
| Other engineering and management services....                                   | 872,874                         | NA                    | NA    | NA     | NA     | NA     | NA     | NA     | NA     | 132    | 129    | 347    |  |

See explanatory information and SOURCE at end of table

Table A-7. Company and other (except Federal) funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company                              | SIC code                     | 1987                  | 1988   | 1989   | 1990   | 1991   | 1992   | 1993   | 1994   | 1995    | 1996    | 1997    |  |
|---|------------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|--|
|   |                              | [Dollars in millions] |        |        |        |        |        |        |        |         |         |         |  |
| Distribution by industry:                                 |                              |                       |        |        |        |        |        |        |        |         |         |         |  |
| Other services.....                                       | 701,72,75-79,81,<br>83,84,89 | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 160     | 317     | 446     |  |
| Other nonmanufacturing industries <sup>1</sup> .....      | 07-12,14,15,<br>161-162,17   | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 402     | 1,156   | 1,541   |  |
| Distribution by size of company:<br>[Number of employees] |                              |                       |        |        |        |        |        |        |        |         |         |         |  |
| Total.....  |                              | 61,403                | 66,672 | 73,501 | 81,602 | 90,580 | 94,388 | 94,591 | 97,131 | 108,652 | 121,015 | 133,611 |  |
| Fewer than 500.....                                       |                              | 6,200                 | (S)    | (S)    | (S)    | 11,285 | 11,532 | 13,006 | 12,802 | 14,684  | 17,948  | 21,854  |  |
| 500 to 999.....   |                              | 1,610                 | 1,748  | 1,934  | 2,144  | 7,819  | 7,807  | 3,048  | 3,426  | 4,468   | 4,418   | 4,590   |  |
| 1,000 to 4,999.....                                       |                              | 6,281                 | 6,820  | 7,546  | 8,363  | 9,403  | 10,865 | 12,219 | 13,533 | 16,162  | 17,761  | 19,049  |  |
| 5,000 to 9,999.....                                       |                              | 3,753                 | 4,075  | 4,509  | 4,997  | 7,233  | 7,495  | 8,371  | 8,087  | 9,289   | 11,068  | 13,655  |  |
| 10,000 to 24,999.....                                     |                              | 9,681                 | 10,512 | 11,631 | 12,890 | 12,397 | 12,328 | 12,606 | 13,625 | 15,125  | 19,133  | 20,597  |  |
| 25,000 or more.....                                       |                              | 33,878                | 36,785 | 40,703 | 45,106 | 42,443 | 44,361 | 45,340 | 45,658 | 48,924  | 50,686  | 53,866  |  |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

<sup>2</sup> Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTES:** Company-funded R&D includes funds for industrial R&D performed within company facilities from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and state governments. Company-financed R&D not performed within the company is excluded.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-8. Company and other (except Federal) funds for industrial R&amp;D performance, by industry and size of company: 1997

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| Industry   | SIC code       | Total   | Size of company                |                            |                                |                                |                                  |                                |
|--|----------------|---------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                |         | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                |         | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| All Industries.....                                |                | 133,611 | 21,854                         | 4,590                      | 19,049                         | 13,655                         | 20,597                           | 53,866                         |
| Manufacturing.....                                 |                | 101,202 | 7,852                          | 2,794                      | 13,975                         | 11,131                         | 16,164                           | 49,287                         |
| Food, kindred, and tobacco products.....           | 20,21          | 1,787   | 101                            | 65                         | 265                            | 391                            | 262                              | 703                            |
| Textiles and apparel.....                          | 22,23          | 476     | 52                             | 34                         | 106                            | (D)                            | 82                               | (D)                            |
| Lumber, wood products, and furniture.....          | 24,25          | 348     | 74                             | 22                         | 77                             | 96                             | 79                               | 0                              |
| Paper and allied products.....                     | 26             | 1,456   | (D)                            | (D)                        | 140                            | 100                            | 339                              | 844 (S)                        |
| Chemicals and allied products.....                 | 28             | 18,628  | 507                            | 189                        | 3,733                          | 3,194                          | 5,934                            | 5,071                          |
| Industrial chemicals.....                          | 281-82,286     | 4,970   | (D)                            | 77                         | 1,185                          | 641                            | 1,913                            | (D)                            |
| Drugs and medicines.....                           | 283            | 11,586  | 232                            | 54                         | 2,045                          | 2,207                          | 3,737                            | 3,311                          |
| Other chemicals.....                               | 284-85,287-89  | 2,072   | (D)                            | 59                         | 502                            | 347                            | 284                              | (D)                            |
| Petroleum refining and extraction.....             | 13,29          | 1,612   | 6                              | 15 (S)                     | 80                             | 0                              | 729                              | 783                            |
| Rubber products.....                               | 30             | 1,372   | (D)                            | 113                        | 410                            | 108                            | 243 (S)                          | (D)                            |
| Stone, clay, and glass products.....               | 32             | 606     | 16                             | 31                         | 71                             | 103                            | 386                              | 0                              |
| Primary metals.....                                | 33             | 767     | 45                             | 21                         | 146                            | 206                            | (D)                              | (D)                            |
| Ferrous metals and products.....                   | 331-32,3398-99 | 414     | 8                              | 2                          | 54                             | 169                            | (D)                              | (D)                            |
| Nonferrous metals and products.....                | 333-36         | 353     | 37                             | 19                         | 91                             | 37                             | (D)                              | (D)                            |
| Fabricated metal products.....                     | 34             | 1,669   | 367                            | (D)                        | 192                            | 157                            | 454                              | (D)                            |
| Machinery.....                                     | 35             | 18,393  | 1,769                          | 585                        | 2,597                          | 1,942                          | 4,142                            | 7,357                          |
| Office, computing, and accounting<br>machines..... | 357            | 12,787  | 830                            | (D)                        | 1,365                          | 898                            | 2,952                            | (D)                            |
| Other machinery, except electrical.....            | 351-56,358-59  | 5,606   | 939                            | (D)                        | 1,232                          | 1,044                          | 1,190                            | (D)                            |
| Electrical equipment.....                          | 36             | 22,747  | 1,683                          | 823                        | 3,456                          | 3,107                          | 1,938                            | 11,739                         |
| Radio and TV receiving equipment.....              | 365            | 152     | 21                             | (D)                        | 122                            | 0                              | 0                                | (D)                            |
| Communication equipment.....                       | 366            | 7,377   | 493                            | (D)                        | 805                            | 1,414                          | 0                                | (D)                            |
| Electronic components.....                         | 367            | 10,786  | 957                            | (D)                        | 1,891                          | 1,427                          | 1,653                            | (D)                            |
| Other electrical equipment.....                    | 361-64,369     | 4,432   | 212                            | 165                        | 638                            | 267                            | 285                              | 2,865                          |

See explanatory information and SOURCE at end of table.

Table A-8. Company and other (except Federal) funds for industrial R&amp;D performance, by industry and size of company: 1997

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| Industry  | SIC code                        | Total  | Size of company                |                            |                                |                                |                                  |                                |
|---|---------------------------------|--------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                                 |        | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                                 |        | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| Transportation equipment.....                               | 37                              | 19,742 | 55                             | 151                        | 269                            | 409                            | 727                              | 18,132                         |
| Motor vehicles and motor vehicles equipment.....            | 371                             | 13,758 | 50                             | 111                        | 87                             | (D)                            | 536                              | (D)                            |
| Other transportation equipment.....                         | 373-75,379                      | 307    | (D)                            | (D)                        | 29                             | (D)                            | (D)                              | (D)                            |
| Aircraft and missiles.....                                  | 372,376                         | 5,677  | (D)                            | (D)                        | 154                            | 178                            | (D)                              | 5,211                          |
| Professional and scientific instruments.....                | 38                              | 8,958  | 1,071                          | 622                        | 2,228                          | 981                            | 509                              | 3,547                          |
| Scientific and mechanical measuring instruments.....        | 381-82                          | 3,719  | 759                            | 427                        | 892                            | 370                            | (D)                              | (D)                            |
| Optical, surgical, photographic, and other instruments..... | 384-87                          | 5,240  | 313                            | 194                        | 1,336                          | 611                            | (D)                              | (D)                            |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                        | 2,642  | 1,916                          | (D)                        | 206                            | (D)                            | (D)                              | (D)                            |
| Nonmanufacturing.....                                       |                                 | 32,409 | 14,002                         | 1,796                      | 5,074                          | 2,524                          | 4,434                            | 4,579                          |
| Transportation and utilities.....                           | 40-42,44-49                     | 2,812  | 56                             | 22                         | 121                            | 70                             | 107                              | 2,437                          |
| Communications.....   | 48                              | 1,884  | 17                             | (D)                        | 20                             | (D)                            | 0                                | (D)                            |
| Telephone communications.....                               | 481                             | 1,826  | 0                              | (D)                        | 0                              | (D)                            | 0                                | 1,802                          |
| Other communications.....                                   | 482-484,489                     | 58     | 17                             | (D)                        | 20                             | 0                              | 0                                | (D)                            |
| Electric, gas, and sanitary services.....                   | 49                              | 258    | 15                             | (D)                        | 92                             | 35                             | (D)                              | (D)                            |
| Other transportation and utilities.....                     | 40-42,44-47                     | 670    | 24                             | (D)                        | 9                              | (D)                            | (D)                              | 625                            |
| Trade.....  | 50-59                           | 7,961  | 3,029                          | (D)                        | 1,575                          | 789                            | (D)                              | 1,297                          |
| Finance, insurance, and real estate.....                    | 60-65,67                        | 1,500  | 340                            | (D)                        | 253                            | 330                            | (D)                              | 266                            |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 18,594 | 9,335                          | 1,483                      | 3,055                          | (D)                            | 3,024                            | (D)                            |
| Business services.....                                      | 73                              | 11,560 | 3,922                          | 800                        | 2,874                          | 1,234                          | (D)                              | (D)                            |
| Computer and data processing services.....                  | 737                             | 11,318 | 3,900                          | 771                        | 2,807                          | 1,224                          | (D)                              | (D)                            |
| Other business services.....                                | 731-736,738                     | 242    | 22                             | 29 (S)                     | 67                             | 10                             | (D)                              | (D)                            |

See explanatory information and SOURCE at end of table.

Table A-8. Company and other (except Federal) funds for industrial R&amp;D performance, by industry and size of company: 1997

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| Industry   | SIC code                     | Total | Size of company                |                            |                                |                                |                                  |                                |
|--|------------------------------|-------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                              |       | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                              |       | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| Health services.....   | 80                           | 679   | 72                             | (D)                        | 43                             | 0                              | (D)                              | 0                              |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                  | (D)   | 60                             | (D)                        | 8 (S)                          | 0                              | (D)                              | 0                              |
| Other health services.....   | 802-805,808-809              | (D)   | 12                             | (D)                        | 36                             | 0                              | 0                                | 0                              |
| Engineering and management services.....   | 87                           | 5,909 | 5,063                          | 631                        | 93                             | (D)                            | 27                               | (D)                            |
| Engineering, architectural, and<br>surveying.....                                  | 871                          | 781   | 632                            | 56                         | 69                             | (D)                            | (D)                              | 0                              |
| Research, development, and testing.....  | 873                          | 4,782 | 4,177                          | 534                        | (D)                            | 0                              | 0                                | (D)                            |
| Other engineering and<br>management services...                                    | 872,874                      | 347   | 254                            | 41                         | (D)                            | (D)                            | (D)                              | 0                              |
| Other services.....  | 701,72,75-79,81,<br>83,84,89 | 446   | 278                            | (D)                        | 45                             | 11                             | (D)                              | 0                              |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17   | 1,541 | 1,241                          | 10                         | 71                             | (D)                            | (D)                              | (D)                            |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-9. Company-financed R&D contracted to outside organizations by R&D-performing companies,  
by industry and size of company: 1991, 1993-97**

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| Industry and size of company                                   | SIC code       | 1991                  | 1993  | 1994  | 1995  | 1996  | 1997  |
|--|----------------|-----------------------|-------|-------|-------|-------|-------|
|  |                | [Dollars in millions] |       |       |       |       |       |
| All Industries.....  |                | 3,319                 | 3,462 | 3,618 | 5,177 | 5,833 | 6,000 |
| Distribution by industry:                                      |                |                       |       |       |       |       |       |
| Manufacturing.....   |                | 2,577                 | 2,339 | 2,450 | 3,812 | 4,293 | 4,143 |
| Food, kindred, and tobacco products.....                       | 20,21          | 44                    | 43    | 43    | 41    | 50    | 53    |
| Textiles and apparel.....                                      | 22,23          | (D)                   | 2     | 4     | 1     | 3     | 9     |
| Lumber, wood products, and furniture.....                      | 24,25          | (D)                   | 8     | 8     | 7     | (D)   | (D)   |
| Paper and allied products.....                                 | 26             | 12                    | 5     | 4     | 14    | 4     | 4 (S) |
| Chemicals and allied products.....                             | 28             | 1,087                 | 1,117 | 1,239 | 2,386 | 2,537 | 2,505 |
| Industrial chemicals.....                                      | 281-82,286     | 95                    | 43    | 38    | 259   | 229   | (D)   |
| Drugs and medicines.....                                       | 283            | 771                   | 942   | 1,055 | 1,751 | 2,098 | 2,259 |
| Other chemicals.....   | 284-85,287-89  | 221                   | 132   | 146   | 376   | 210   | (D)   |
| Petroleum refining and extraction.....                         | 13,29          | 35                    | 56    | 52    | 32    | 24    | (D)   |
| Rubber products.....   | 30             | 18                    | 65    | 22    | 32    | 36    | 32    |
| Stone, clay, and glass products.....                           | 32             | (D)                   | 2     | 6     | 2     | 9     | (D)   |
| Primary metals.....  | 33             | 24                    | 12    | 15    | 13    | 16    | 9     |
| Ferrous metals and products.....                               | 331-32,3398-99 | 4                     | 8     | 10    | 5     | 4     | 4     |
| Nonferrous metals and products.....                            | 333-36         | 20                    | 4     | 5     | 8     | 11    | 5     |
| Fabricated metal products.....                                 | 34             | 3                     | 21    | 21    | 10    | 28    | 10    |
| Machinery.....   | 35             | 256                   | 125   | 200   | 201   | 330   | 363   |
| Office, computing, and accounting<br>machines.....             | 357            | 229                   | 52    | 113   | 84    | 220   | 192   |
| Other machinery, except electrical.....                        | 351-56,358-59  | 27                    | 73    | 87    | 117   | 110   | 171   |
| Electrical equipment.....                                      | 36             | 114                   | 143   | 116   | 194   | 178   | 186   |
| Radio and TV receiving equipment.....                          | 365            | 0                     | (D)   | 1     | 2     | (D)   | (D)   |
| Communication equipment.....                                   | 366            | 63                    | 20    | 38    | 40    | (D)   | 67    |
| Electronic components.....                                     | 367            | 38                    | 24    | 24    | 75    | 88    | 44    |
| Other electrical equipment.....                                | 361-64,369     | 13                    | (D)   | 54    | 77    | 54    | (D)   |
| Transportation equipment.....                                  | 37             | 687                   | (D)   | 591   | (D)   | (D)   | (D)   |
| Motor vehicles and motor vehicles<br>equipment.....            | 371            | (D)                   | (D)   | (D)   | (D)   | (D)   | (D)   |
| Other transportation equipment.....                            | 373-75,379     | (S)                   | (D)   | (D)   | 5     | (D)   | (D)   |
| Aircraft and missiles.....                                     | 372,376        | (D)                   | 52    | 83    | 72    | (D)   | (D)   |
| Professional and scientific instruments.....                   | 38             | (D)                   | 189   | 57    | 114   | 55    | 83    |
| Scientific and mechanical measuring<br>instruments.....        | 381-82         | 4                     | 25    | 16    | 45    | 8     | 24    |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87         | (D)                   | 163   | 40    | 68    | 47    | 60    |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39       | 2                     | (D)   | 72    | (D)   | 26    | 122   |
| Nonmanufacturing <sup>2</sup> .....                            |                | 742                   | 1,123 | 1,168 | 1,365 | 1,540 | 1,857 |

See explanatory information and SOURCE at end of table.

**Table A-9. Company-financed R&D contracted to outside organizations by R&D-performing companies,  
by industry and size of company: 1991, 1993-97**

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| Industry and size of company  | SIC code                        | 1991                  | 1993 | 1994 | 1995 | 1996    | 1997 |
|---|---------------------------------|-----------------------|------|------|------|---------|------|
|   |                                 | [Dollars in millions] |      |      |      |         |      |
| <b>Distribution by industry:</b>  |                                 |                       |      |      |      |         |      |
| Transportation and utilities.....   | 40-42,44-49                     | NA                    | NA   | NA   | 509  | 466     | 405  |
| Communications.....   | 48                              | NA                    | NA   | NA   | 264  | 230     | (D)  |
| Telephone communications.....   | 481                             | NA                    | NA   | NA   | (D)  | (D)     | (D)  |
| Other communications.....   | 482-484,489                     | NA                    | NA   | NA   | (D)  | (D)     | 0    |
| Electric, gas, and sanitary services.....   | 49                              | NA                    | NA   | NA   | 219  | 229     | 207  |
| Other transportation and utilities.....   | 40-42,44-47                     | NA                    | NA   | NA   | 27   | 6       | (D)  |
| Trade.....  | 50-59                           | NA                    | NA   | NA   | 346  | 217     | 353  |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA                    | NA   | NA   | 92   | 153 (S) | 184  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA                    | NA   | NA   | 416  | 694     | 905  |
| Business services.....  | 73                              | NA                    | NA   | NA   | 151  | 226     | 235  |
| Computer and data processing<br>services.....   | 737                             | NA                    | NA   | NA   | 139  | 224     | 233  |
| Other business services.....  | 731-736,738                     | NA                    | NA   | NA   | 12   | 2       | 2    |
| Health services.....  | 80                              | NA                    | NA   | NA   | 38   | 66 (S)  | (D)  |
| Offices and clinics of medical<br>doctors, hospitals,<br>medical and dental labs..... | 801,806,807                     | NA                    | NA   | NA   | (D)  | (D)     | (D)  |
| Other health services.....  | 802-805,808-809                 | NA                    | NA   | NA   | (D)  | (D)     | (D)  |
| Engineering and management<br>services.....   | 87                              | NA                    | NA   | NA   | 200  | 396     | 483  |
| Engineering, architectural, and<br>surveying.....                                     | 871                             | NA                    | NA   | NA   | 13   | 22      | 11   |
| Research, development, and<br>testing.....  | 873                             | NA                    | NA   | NA   | 187  | 373     | 472  |
| Other engineering and<br>management services...                                       | 872,874                         | NA                    | NA   | NA   | 0    | 0       | 0    |
| Other services.....   | 701,72,75-79,81,<br>83,84,89    | NA                    | NA   | NA   | 27   | 6       | (D)  |
| Other nonmanufacturing industries <sup>1</sup> .....                                  | 07-12,14,15,<br>161-162,17      | NA                    | NA   | NA   | 1    | 10      | 10   |

See explanatory information and SOURCE at end of table.

**Table A-9. Company-financed R&D contracted to outside organizations by R&D-performing companies,  
by industry and size of company: 1991, 1993-97**

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| Industry and size of company                              | SIC code | 1991                  | 1993  | 1994  | 1995  | 1996    | 1997  |
|---|----------|-----------------------|-------|-------|-------|---------|-------|
|   |          | [Dollars in millions] |       |       |       |         |       |
| Distribution by size of company:<br>[Number of employees] |          |                       |       |       |       |         |       |
| Total.....  |          | 3,319                 | 3,462 | 3,618 | 5,177 | 5,833   | 6,000 |
| Fewer than 500.....                                       |          | (S)                   | 751   | 724   | 674   | 699     | 799   |
| 500 to 999.....   |          | 35                    | 107   | 126   | 174   | 161 (S) | 220   |
| 1,000 to 4,999.....                                       |          | 275                   | 310   | 397   | 632   | 632     | 984   |
| 5,000 to 9,999.....                                       |          | 218                   | 327   | 408   | 393   | 761     | 992   |
| 10,000 to 24,999.....                                     |          | 881                   | 468   | 391   | 786   | 1,458   | 1,031 |
| 25,000 or more.....                                       |          | 1,762                 | 1,497 | 1,574 | 2,518 | 2,121   | 1,974 |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

<sup>2</sup> Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTE:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-10. Number of R&D-performing companies contracting R&D performance to outside organizations  
and total number of R&D-performing companies, by industry and size of company: 1997**

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| Industry  | SIC code       | Total  |         | Size of company          |         |                      |         |                          |         |                          |         |                            |         |                          |         |
|---|----------------|--------|---------|--------------------------|---------|----------------------|---------|--------------------------|---------|--------------------------|---------|----------------------------|---------|--------------------------|---------|
|   |                |        |         | Fewer than 500 employees |         | 500 to 999 employees |         | 1,000 to 4,999 employees |         | 5,000 to 9,999 employees |         | 10,000 to 24,999 employees |         | 25,000 or more employees |         |
|   |                | Total  | Outside | Total                    | Outside | Total                | Outside | Total                    | Outside | Total                    | Outside | Total                      | Outside | Total                    | Outside |
| All Industries.....                             |                | 35,112 | 3,342   | 31,995                   | 2,729   | 1,127                | 151     | 1,302                    | 227     | 322                      | 111     | 199                        | 48      | 167                      | 75      |
| Manufacturing.....                              |                | 18,130 | 1,897   | 15,898                   | 1,549   | 886                  | 127     | 938                      | 141     | 197                      | 34      | 138                        | 29      | 73                       | 17      |
| Food, kindred, and tobacco products.....        | 20,21          | 696    | 134     | 426                      | 69      | 112                  | 43      | 115                      | 14      | 17                       | 4       | 15                         | 2       | 11                       | 2       |
| Textiles and apparel.....                       | 22,23          | 278    | 35      | 181                      | 17      | 44                   | 15      | 41                       | 2       | 3                        | 0       | 7                          | 1       | 2                        | 0       |
| Lumber, wood products, and furniture.....       | 24,25          | 257    | 11      | 162                      | 4       | 52                   | 2       | 29                       | 4       | 10                       | 1       | 4                          | 0       | 0                        | 0       |
| Paper and allied products.....                  | 26             | 121    | 11      | 57                       | 0       | 2                    | 0       | 41                       | 9       | 6                        | 1       | 9                          | 0       | 6                        | 1       |
| Chemicals and allied products.....              | 28             | 602    | 130     | 424                      | 88      | 32                   | 6       | 95                       | 17      | 27                       | 9       | 17                         | 6       | 6                        | 4       |
| Industrial chemicals.....                       | 281-82,286     | 161    | 29      | 91                       | 20      | 8                    | 0       | 42                       | 5       | 11                       | 1       | 7                          | 2       | 2                        | 1       |
| Drugs and medicines.....                        | 283            | 199    | 73      | 159                      | 55      | 3                    | 1       | 22                       | 8       | 7                        | 4       | 5                          | 3       | 3                        | 2       |
| Other chemicals.....                            | 284-85,287-89  | 242    | 28      | 174                      | 13      | 21                   | 5       | 32                       | 4       | 9                        | 4       | 5                          | 1       | 1                        | 1       |
| Petroleum refining and extraction.....          | 13,29          | 26     | 4       | 2                        | 0       | 3                    | 0       | 11                       | 1       | 0                        | 0       | 7                          | 3       | 3                        | 0       |
| Rubber products.....                            | 30             | 639    | 32      | 459                      | 14      | 93                   | 9       | 73                       | 6       | 7                        | 1       | 5                          | 2       | 2                        | 1       |
| Stone, clay, and glass products.....            | 32             | 98     | 8       | 65                       | 0       | 10                   | 2       | 13                       | 5       | 5                        | 0       | 5                          | 1       | 0                        | 0       |
| Primary metals.....                             | 33             | 250    | 18      | 126                      | 4       | 63                   | 2       | 31                       | 6       | 17                       | 3       | 10                         | 2       | 3                        | 1       |
| Ferrous metals and products.....                | 331-32,3398-99 | 54     | 11      | 11                       | 3       | 4                    | 0       | 17                       | 3       | 14                       | 3       | 8                          | 1       | 1                        | 1       |
| Nonferrous metals and products.....             | 333-36         | 196    | 7       | 116                      | 1       | 59                   | 2       | 14                       | 3       | 3                        | 0       | 2                          | 1       | 2                        | 0       |
| Fabricated metal products.....                  | 34             | 903    | 65      | 731                      | 45      | 74                   | 5       | 74                       | 10      | 10                       | 1       | 11                         | 4       | 2                        | 0       |
| Machinery.....                                  | 35             | 1,536  | 130     | 1,233                    | 78      | 108                  | 15      | 144                      | 26      | 28                       | 5       | 18                         | 4       | 5                        | 2       |
| Office, computing, and accounting machines..... | 357            | 119    | 7       | 77                       | 1       | 10                   | 0       | 16                       | 3       | 8                        | 1       | 6                          | 1       | 2                        | 1       |
| Other machinery, except electrical.....         | 351-56,358-59  | 1,417  | 123     | 1,156                    | 77      | 98                   | 15      | 128                      | 23      | 20                       | 4       | 12                         | 3       | 3                        | 1       |
| Electrical equipment.....                       | 36             | 1,547  | 284     | 1,217                    | 239     | 140                  | 14      | 136                      | 20      | 33                       | 7       | 11                         | 2       | 11                       | 2       |
| Radio and TV receiving equipment.....           | 365            | 19     | 3       | 14                       | 2       | 2                    | 1       | 3                        | 0       | 0                        | 0       | 0                          | 0       | 0                        | 0       |
| Communication equipment.....                    | 366            | 322    | 89      | 255                      | 81      | 25                   | 2       | 23                       | 4       | 16                       | 1       | 0                          | 0       | 3                        | 1       |
| Electronic components.....                      | 367            | 748    | 121     | 625                      | 110     | 60                   | 1       | 46                       | 8       | 10                       | 1       | 5                          | 1       | 2                        | 0       |
| Other electrical equipment.....                 | 361-64,369     | 460    | 72      | 323                      | 47      | 54                   | 10      | 64                       | 8       | 7                        | 5       | 6                          | 1       | 6                        | 1       |

See explanatory information and SOURCE at end of table.

**Table A-10. Number of R&D-performing companies contracting R&D performance to outside organizations  
and total number of R&D-performing companies, by industry and size of company: 1997**

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| Industry  | SIC code                        | Total  |         | Size of company          |         |                      |         |                          |         |                          |         |                            |         |                          |         |
|---|---------------------------------|--------|---------|--------------------------|---------|----------------------|---------|--------------------------|---------|--------------------------|---------|----------------------------|---------|--------------------------|---------|
|   |                                 |        |         | Fewer than 500 employees |         | 500 to 999 employees |         | 1,000 to 4,999 employees |         | 5,000 to 9,999 employees |         | 10,000 to 24,999 employees |         | 25,000 or more employees |         |
|   |                                 | Total  | Outside | Total                    | Outside | Total                | Outside | Total                    | Outside | Total                    | Outside | Total                      | Outside | Total                    | Outside |
| Transportation equipment.....                               | 37                              | 411    | 111     | 302                      | 100     | 54                   | 0       | 18                       | 5       | 14                       | 1       | 10                         | 1       | 13                       | 4       |
| Motor vehicles and motor vehicles equipment.....            | 371                             | 377    | 105     | 300                      | 100     | 51                   | 0       | 6                        | 1       | 8                        | 1       | 8                          | 1       | 4                        | 2       |
| Other transportation equipment.....                         | 373-75,379                      | 10     | 1       | 0                        | 0       | 2                    | 0       | 4                        | 1       | 1                        | 0       | 1                          | 0       | 2                        | 0       |
| Aircraft and missiles.....                                  | 372,376                         | 24     | 5       | 2                        | 0       | 1                    | 0       | 8                        | 3       | 5                        | 0       | 1                          | 0       | 7                        | 2       |
| Professional and scientific instruments....                 | 38                              | 760    | 130     | 611                      | 104     | 58                   | 11      | 74                       | 14      | 10                       | 1       | 3                          | 0       | 5                        | 0       |
| Scientific and mechanical measuring instruments.....        | 381-82                          | 515    | 62      | 440                      | 52      | 37                   | 6       | 29                       | 4       | 4                        | 0       | 2                          | 0       | 3                        | 0       |
| Optical, surgical, photographic, and other instruments..... | 384-87                          | 246    | 68      | 171                      | 52      | 21                   | 5       | 45                       | 10      | 6                        | 1       | 1                          | 0       | 2                        | 0       |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                        | 10,005 | 796     | 9,901                    | 789     | 40                   | 3       | 44                       | 3       | 10                       | 0       | 6                          | 1       | 4                        | 0       |
| Nonmanufacturing .....                                      |                                 | 16,982 | 1,445   | 16,097                   | 1,180   | 241                  | 24      | 364                      | 86      | 125                      | 77      | 61                         | 19      | 94                       | 58      |
| Transportation and utilities.....                           | 40-42,44-49                     | 417    | 226     | 204                      | 52      | 5                    | 1       | 65                       | 50      | 67                       | 63      | 10                         | 6       | 66                       | 54      |
| Communications.....   | 48                              | 90     | 52      | 24                       | 0       | 2                    | 0       | 4                        | 0       | 51                       | 50      | 0                          | 0       | 9                        | 2       |
| Telephone communications.....                               | 481                             | 59     | 52      | 0                        | 0       | 0                    | 0       | 0                        | 0       | 51                       | 50      | 0                          | 0       | 8                        | 2       |
| Other communications.....                                   | 482-484,489                     | 31     | 0       | 24                       | 0       | 2                    | 0       | 4                        | 0       | 0                        | 0       | 0                          | 0       | 1                        | 0       |
| Electric, gas, and sanitary services.....                   | 49                              | 161    | 70      | 77                       | 2       | 2                    | 1       | 57                       | 49      | 14                       | 11      | 9                          | 5       | 2                        | 2       |
| Other transportation and utilities.....                     | 40-42,44-47                     | 166    | 104     | 103                      | 50      | 1                    | 0       | 4                        | 1       | 2                        | 2       | 1                          | 1       | 55                       | 50      |
| Trade.....  | 50-59                           | 3,713  | 378     | 3,567                    | 353     | 14                   | 2       | 73                       | 11      | 20                       | 7       | 30                         | 5       | 10                       | 0       |
| Finance, insurance, and real estate.....                    | 60-65,67                        | 382    | 221     | 309                      | 200     | 31                   | 0       | 23                       | 13      | 9                        | 2       | 3                          | 3       | 7                        | 3       |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 4,891  | 563     | 4,482                    | 525     | 182                  | 16      | 179                      | 12      | 20                       | 4       | 17                         | 5       | 11                       | 1       |
| Business services.....                                      | 73                              | 2,455  | 342     | 2,276                    | 318     | 84                   | 9       | 65                       | 10      | 14                       | 4       | 5                          | 0       | 10                       | 1       |
| Computer and data processing services.....                  | 737                             | 2,273  | 288     | 2,144                    | 267     | 63                   | 8       | 51                       | 10      | 10                       | 2       | 3                          | 0       | 3                        | 1       |
| Other business services.....                                | 731-736,738                     | 181    | 54      | 133                      | 51      | 22                   | 1       | 14                       | 0       | 4                        | 2       | 2                          | 0       | 7                        | 0       |

See explanatory information and SOURCE at end of table.

**Table A-10. Number of R&D-performing companies contracting R&D performance to outside organizations  
and total number of R&D-performing companies, by industry and size of company: 1997**

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| Industry  | SIC code                     | Total |         | Size of company          |         |                      |         |                          |         |                          |         |                            |         |                          |         |
|---|------------------------------|-------|---------|--------------------------|---------|----------------------|---------|--------------------------|---------|--------------------------|---------|----------------------------|---------|--------------------------|---------|
|   |                              |       |         | Fewer than 500 employees |         | 500 to 999 employees |         | 1,000 to 4,999 employees |         | 5,000 to 9,999 employees |         | 10,000 to 24,999 employees |         | 25,000 or more employees |         |
|   |                              | Total | Outside | Total                    | Outside | Total                | Outside | Total                    | Outside | Total                    | Outside | Total                      | Outside | Total                    | Outside |
| Health services.....  | 80                           | 483   | 6       | 456                      | 3       | 3                    | 0       | 21                       | 2       | 0                        | 0       | 3                          | 1       | 0                        | 0       |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                  | 427   | 4       | 404                      | 2       | 3                    | 0       | 17                       | 1       | 0                        | 0       | 3                          | 1       | 0                        | 0       |
| Other health services.....  | 802-805,808-809              | 56    | 2       | 52                       | 1       | 0                    | 0       | 4                        | 1       | 0                        | 0       | 0                          | 0       | 0                        | 0       |
| Engineering and management services.....  | 87                           | 1,569 | 210     | 1,495                    | 203     | 42                   | 6       | 23                       | 0       | 3                        | 0       | 5                          | 1       | 1                        | 0       |
| Engineering, architectural, and surveying.....                                  | 871                          | 697   | 42      | 661                      | 38      | 14                   | 3       | 18                       | 0       | 1                        | 0       | 3                          | 1       | 0                        | 0       |
| Research, development, and testing.....   | 873                          | 727   | 168     | 711                      | 165     | 13                   | 3       | 2                        | 0       | 0                        | 0       | 0                          | 0       | 1                        | 0       |
| Other engineering and management services.....                                  | 872,874                      | 145   | 0       | 123                      | 0       | 15                   | 0       | 3                        | 0       | 2                        | 0       | 2                          | 0       | 0                        | 0       |
| Other services.....   | 701,72,75-79,81,<br>83,84,89 | 385   | 6       | 255                      | 2       | 53                   | 1       | 70                       | 0       | 3                        | 0       | 4                          | 3       | 0                        | 0       |
| Other nonmanufacturing industries <sup>1</sup> .....                            | 07-12,14,15,<br>161-162,17   | 7,579 | 57      | 7,535                    | 50      | 8                    | 5       | 24                       | 1       | 9                        | 1       | 1                          | 0       | 1                        | 0       |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-11. Company-financed R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by industry and size of company: 1987-97**

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| Industry and size of company                                   | SIC code       | 1987                  | 1988  | 1989  | 1990  | 1991  | 1992   | 1993  | 1994  | 1995   | 1996   | 1997   |  |
|--|----------------|-----------------------|-------|-------|-------|-------|--------|-------|-------|--------|--------|--------|--|
|  |                | [Dollars in millions] |       |       |       |       |        |       |       |        |        |        |  |
| All Industries.....  |                | 5,226                 | 6,208 | 6,706 | 7,952 | 9,147 | 10,063 | 9,565 | 9,395 | 13,052 | 14,050 | 13,107 |  |
| Distribution by industry:                                      |                |                       |       |       |       |       |        |       |       |        |        |        |  |
| Manufacturing.....   |                | 5,162                 | 6,062 | 6,450 | 7,537 | 8,369 | 9,228  | 7,795 | 7,895 | 10,846 | 11,540 | 11,743 |  |
| Food, kindred, and tobacco products.....                       | 20,21          | 37                    | 27    | 42    | 41    | 66    | 88     | 112   | 117   | 142    | 155    | 148    |  |
| Textiles and apparel.....                                      | 22,23          | NA                    | NA    | NA    | NA    | NA    | NA     | NA    | NA    | NA     | NA     | (D)    |  |
| Lumber, wood products, and furniture.....                      | 24,25          | NA                    | NA    | NA    | NA    | NA    | NA     | NA    | NA    | NA     | NA     | (D)    |  |
| Paper and allied products.....                                 | 26             | NA                    | NA    | NA    | NA    | NA    | NA     | NA    | NA    | NA     | NA     | 34     |  |
| Chemicals and allied products.....                             | 28             | 1,243                 | 1,548 | 1,532 | 2,007 | 2,401 | 2,676  | 2,833 | 2,456 | 4,194  | 3,801  | 3,867  |  |
| Industrial chemicals <sup>1</sup> .....                        | 281-82,286     | 625                   | 855   | 609   | 720   | 1,009 | 1,045  | 1,318 | 917   | 1,632  | 1,720  | 863    |  |
| Drugs and medicines.....                                       | 283            | 618                   | 693   | 923   | 1,287 | 1,392 | 1,631  | 1,516 | 1,539 | 2,562  | 2,082  | 2,413  |  |
| Other chemicals.....   | 284-85,287-89  | TA                    | TA    | TA    | TA    | TA    | TA     | TA    | TA    | TA     | TA     | 591    |  |
| Petroleum refining and extraction.....                         | 13,29          | 47                    | 59    | 47    | 76    | 107   | 119    | 104   | 111   | 76     | 78     | 91     |  |
| Rubber products.....   | 30             | NA                    | NA    | NA    | NA    | NA    | NA     | NA    | NA    | NA     | NA     | 197    |  |
| Stone, clay, and glass products.....                           | 32             | (D)                   | (D)   | (D)   | 59    | 38    | 41     | 38    | 27    | 31     | 32     | 17     |  |
| Primary metals.....  | 33             | 18                    | 23    | 24    | 26    | 20    | 18     | 12    | 15    | 26     | 29     | 20     |  |
| Ferrous metals and products.....                               | 331-32,3398-99 | NA                    | NA    | NA    | NA    | NA    | NA     | NA    | NA    | NA     | NA     | (D)    |  |
| Nonferrous metals and products.....                            | 333-36         | NA                    | NA    | NA    | NA    | NA    | NA     | NA    | NA    | NA     | NA     | (D)    |  |
| Fabricated metal products.....                                 | 34             | 40                    | (D)   | (D)   | 95    | 86    | 109    | 119   | 125   | 111    | 133    | 132    |  |
| Machinery.....   | 35             | 1,233                 | 1,326 | 1,432 | 1,451 | 1,476 | 1,439  | 340   | 308   | 501    | 1,404  | 1,819  |  |
| Office, computing, and accounting machines.....                | 357            | NA                    | NA    | NA    | NA    | NA    | NA     | NA    | NA    | NA     | NA     | 1,196  |  |
| Other machinery, except electrical.....                        | 351-56,358-59  | NA                    | NA    | NA    | NA    | NA    | NA     | NA    | NA    | NA     | NA     | 623    |  |
| Electrical equipment.....                                      | 36             | 432                   | 591   | 573   | 770   | 651   | 568    | 525   | 495   | 872    | 959    | 981    |  |
| Radio and TV receiving equipment.....                          | 365            | 0                     | (D)   | (D)   | (D)   | 2     | (D)    | (D)   | 3     | (D)    | (D)    | 0      |  |
| Communication equipment.....                                   | 366            | 188                   | 290   | 199   | 174   | 151   | (D)    | (D)   | 110   | (D)    | (D)    | 399    |  |
| Electronic components.....                                     | 367            | 204                   | 246   | 160   | 185   | 164   | 168    | 322   | 276   | 437    | 470    | 362    |  |
| Other electrical equipment.....                                | 361-64,369     | 39                    | (D)   | (D)   | (D)   | 334   | 217    | 113   | 107   | 291    | 260    | 220    |  |
| Transportation equipment.....                                  | 37             | (D)                   | 1,750 | 1,916 | 2,055 | 2,402 | (D)    | (D)   | (D)   | (D)    | (D)    | (D)    |  |
| Motor vehicles and motor vehicles equipment <sup>1</sup> ..... | 371            | (D)                   | 1,477 | 1,501 | 1,901 | 2,166 | (D)    | (D)   | (D)   | (D)    | (D)    | (D)    |  |
| Other transportation equipment.....                            | 373-75,379     | TA                    | TA    | TA    | TA    | TA    | TA     | TA    | TA    | TA     | TA     | 19     |  |
| Aircraft and missiles.....                                     | 372,376        | 237                   | 273   | 415   | 154   | 236   | 493    | (D)   | 251   | 284    | (D)    | (D)    |  |

See explanatory information and SOURCE at end of table.

**Table A-11. Company-financed R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by industry and size of company: 1987-97**

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| Industry and size of company  | SIC code                        | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993  | 1994  | 1995  | 1996  | 1997  |     |
|---|---------------------------------|-----------------------|------|------|------|------|------|-------|-------|-------|-------|-------|-----|
|   |                                 | [Dollars in millions] |      |      |      |      |      |       |       |       |       |       |     |
| Distribution by industry:   |                                 |                       |      |      |      |      |      |       |       |       |       |       |     |
| Professional and scientific instruments.....                                    | 38                              | 317                   | 404  | 474  | 611  | 656  | 685  | 751   | 900   | 988   | 960   | 1,201 |     |
| Scientific and mechanical measuring instruments.. ..                            | 381-82                          | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | 200   |     |
| Optical, surgical, photographic, and other instruments.....                     | 384-87                          | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | 1,001 |     |
| Other manufacturing industries <sup>2</sup> .....                               | 27,31,39                        | 138                   | 178  | 269  | 344  | 467  | 524  | (D)   | 572   | (D)   | (D)   | 86    |     |
| Nonmanufacturing <sup>3</sup> .....   |                                 | 64                    | 146  | 256  | 415  | 778  | 835  | 1,770 | 1,500 | 2,206 | 2,510 | 1,364 |     |
| Transportation and utilities.....   | 40-42,44-49                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | 6   |
| Communications.....   | 48                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Telephone communications.....   | 481                             | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Other communications.....   | 482-484,489                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | 0   |
| Electric, gas, and sanitary services.....                                       | 49                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Other transportation and utilities.....   | 40-42,44-47                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Trade.....  | 50-59                           | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | 408 |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | 0   |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | 914 |
| Business services.....  | 73                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | 786 |
| Computer and data processing services.....                                      | 737                             | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Other business services.....  | 731-736,738                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Health services.....  | 80                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Other health services.....  | 802-805,808-809                 | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | (D) |
| Engineering and management services.....  | 87                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | 89  |
| Engineering, architectural, and surveying...                                    | 871                             | NA                    | NA   | NA   | NA   | NA   | NA   | NA    | NA    | NA    | NA    | NA    | 10  |

See explanatory information and SOURCE at end of table.

**Table A-11. Company-financed R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by industry and size of company: 1987-97**

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| Industry and size of company                         | SIC code                     | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |        |
|--|------------------------------|-----------------------|------|------|------|------|------|------|------|------|------|------|--------|
|  |                              | [Dollars in millions] |      |      |      |      |      |      |      |      |      |      |        |
| <b>Distribution by industry:</b>                     |                              |                       |      |      |      |      |      |      |      |      |      |      |        |
| Research, development, and testing                   | 873                          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 75     |
| Other engineering and management services.....       | 872,874                      | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 3      |
| Other services.....                                  | 701,72,75-79,81,<br>83,84,89 | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)    |
| Other nonmanufacturing industries <sup>2</sup> ..... | 07-12,14,15,<br>161-162,17   | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 36     |
| <b>Distribution by size of company:</b>              |                              |                       |      |      |      |      |      |      |      |      |      |      |        |
| [Number of employees]                                |                              |                       |      |      |      |      |      |      |      |      |      |      |        |
| Total.....   |                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 13,107 |
| Fewer than 500.....                                  |                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 324    |
| 500 to 999.....                                      |                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 205    |
| 1,000 to 4,999.....                                  |                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2,057  |
| 5,000 to 9,999.....                                  |                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 1,352  |
| 10,000 to 24,999.....                                |                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2,632  |
| 25,000 or more.....                                  |                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 6,537  |

<sup>1</sup> Until 1997, the values for Industrial chemicals (SIC 281 282, 286) and Other chemicals (SIC 284 285, 287 289) were combined and displayed as Industrial and other chemicals (SIC 281 282, 284 289). Also, the value for Motor vehicles and motor vehicles equipment (SIC 371) and Other transportation equipment (SIC 373 375, 379) were combined and displayed as Motor vehicles and other transportation (SIC 371, 373 375, 379).

<sup>2</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

<sup>3</sup> Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10 11, 14 17, 40 42, 44 51, 53 54, 56, 60, 62-63, 72 73, 78, 806 07, and 87.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

NA = Not available.

TA = Total not available separately.

**NOTES:** Data are reported in current U.S. dollars.

As a result of a new sample design, statistics for 1988 91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-12. Company-financed industrial R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by country: 1997**

| Location of foreign subsidiary  | Number of companies | Total<br>[Dollars in millions] |
|---|---------------------|--------------------------------|
| Total <sup>1</sup> .....  | 1,122               | 13,107                         |
| Distribution by country:  |                     |                                |
| Canada.....   | 127                 | 432                            |
| Germany.....  | 119                 | 1,772                          |
| France.....   | 108                 | 787                            |
| Japan.....  | 71                  | 700                            |
| United Kingdom.....   | 190                 | 1,025                          |
| Puerto Rico.....  | 16                  | 18                             |
| Other countries.....  | 337                 | 1,900                          |
| Undistributed <sup>2</sup> .....  | 776                 | 6,473                          |
| Distribution by companies with R&D expenditures in one or more countries: |                     |                                |
| Total.....  | 1,122               | 13,107                         |
| One country.....  | 126                 | 235                            |
| Two countries.....  | 23                  | 137                            |
| Three countries....   | 13                  | 44                             |
| Four countries.   | 1                   | (D)                            |
| Five countries.....   | 1                   | (D)                            |
| More than five countries  | 0                   | 0                              |
| Undistributed <sup>2 3</sup> .....  | 958                 | 12,676                         |

<sup>1</sup> Detail does not add to total because categories are not mutually exclusive.

<sup>2</sup> Includes data reported on Form RD-1L that were not allocated to a specific country, and total foreign R&D reported on Form RD-1A. Form RD-1A does not collect data by country.

<sup>3</sup> To avoid double counting, if a company reported ANY foreign R&D expenditures that were not allocated to specific countries, all foreign R&D expenditures, including those that may have been allocated to specific countries, are included in this cell. For example, if a company allocated a portion of its foreign R&D expenditures to Canada and left the remainder unallocated, ALL of its foreign R&D is included in this cell because it could not be determined during processing how many other countries were sites of R&D performance.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

**NOTE:** Data are reported in current U.S. dollars.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-13. Federal funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company                     | SIC code       | 1987                  | 1988   | 1989   | 1990   | 1991   | 1992   | 1993   | 1994   | 1995    | 1996   | 1997   |  |
|--|----------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--|
|  |                | [Dollars in millions] |        |        |        |        |        |        |        |         |        |        |  |
| All Industries.....                              |                | 30,752                | 30,343 | 28,554 | 28,125 | 26,372 | 24,722 | 22,809 | 22,463 | 23,451  | 23,653 | 23,928 |  |
| Distribution by industry:                        |                |                       |        |        |        |        |        |        |        |         |        |        |  |
| Manufacturing.....                               |                | 28,052                | 27,088 | 24,826 | 23,683 | 20,867 | 19,152 | 16,669 | 17,373 | 18,831  | 20,020 | 19,823 |  |
| Food, kindred, and tobacco products.....         | 20,21          | 2                     | (D)    | (D)    | (D)    | 0      | 0      | 0      | 0      | 0       | 0      | 0      |  |
| Textiles and apparel.....                        | 22,23          | (D)                   | (D)    | (D)    | (D)    | (S)    | (D)    | (D)    | (D)    | (D)     | (D)    | (D)    |  |
| Lumber, wood products, and furniture.....        | 24,25          | 0                     | (D)    | 0      | 0      | (D)    | (D)    | (D)    | (D)    | (D)     | (D)    | 0      |  |
| Paper and allied products.....                   | 26             | (D)                   | (D)    | 0      | 0      | (D)    | (D)    | (D)    | (D)    | (D)     | (D)    | (D)    |  |
| Chemicals and allied products.....               | 28             | 190                   | 238    | 126    | 123    | 209    | (S)    | (D)    | (D)    | 210 (S) | (D)    | (D)    |  |
| Industrial chemicals.....                        | 281-82,286     | 185                   | 232    | 111    | 109    | 165    | (S)    | (D)    | (D)    | (D)     | (D)    | (D)    |  |
| Drugs and medicines.....                         | 283            | (D)                   | 6      | (D)    | (D)    | (D)    | (S)    | 15     | 8      | 14      | 3      | 3 (S)  |  |
| Other chemicals.....                             | 284-85,287-89  | (D)                   | 0      | (D)    | (D)    | (D)    | (S)    | (D)    | (D)    | (D)     | 0      | (D)    |  |
| Petroleum refining and extraction.....           | 13,29          | 14                    | 22     | (S)    | (S)    | 11     | 9      | 14     | 10     | 6       | 24     | (D)    |  |
| Rubber products.....                             | 30             | (D)                   | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)     | (D)    | (D)    |  |
| Stone, clay, and glass products.....             | 32             | 10                    | (D)    | (D)    | (D)    | (D)    | (D)    | 9      | 38     | 6       | 5      | 2      |  |
| Primary metals.....                              | 33             | 19                    | 17     | 22     | (D)    | 8      | (S)    | 23     | 17     | 13      | (D)    | 221    |  |
| Ferrous metals and products.....                 | 331-32,3398-99 | (D)                   | 1      | (D)    | (D)    | 1      | (D)    | 17     | (D)    | (D)     | (D)    | (D)    |  |
| Nonferrous metals and products.....              | 333-36         | (D)                   | 16     | (D)    | (D)    | 7      | (D)    | 6      | (D)    | (D)     | (D)    | (D)    |  |
| Fabricated metal products.....                   | 34             | 150                   | 163    | 178    | 203    | 226    | 294    | 222    | 243    | 86      | (D)    | 129    |  |
| Machinery.....                                   | 35             | (D)                   | (D)    | (D)    | 871    | 1,055  | 1,035  | 86     | 99     | (D)     | 117    | 106    |  |
| Office, computing, and accounting machines.....  | 357            | (D)                   | (D)    | (D)    | (D)    | (D)    | (D)    | 33     | 28     | (D)     | (D)    | 53     |  |
| Other machinery, except electrical.....          | 351-56,358-59  | 44                    | 101    | 112    | (D)    | (D)    | (D)    | 53     | 71     | 64      | (D)    | 53     |  |
| Electrical equipment.....                        | 36             | 5,399                 | 4,153  | 3,743  | 4,133  | 4,550  | 3,844  | 1,667  | 1,801  | 1,690   | 2,143  | 1,839  |  |
| Radio and TV receiving equipment.....            | 365            | 0                     | 0      | 0      | 0      | 0      | (D)    | (D)    | (D)    | (D)     | (D)    | (D)    |  |
| Communication equipment.....                     | 366            | 4,729                 | 3,630  | 2,911  | 2,344  | (D)    | (D)    | (D)    | (D)    | (D)     | (D)    | (D)    |  |
| Electronic components.....                       | 367            | 656                   | 449    | 369    | 418    | (D)    | 247    | 206    | 162    | (D)     | (D)    | (D)    |  |
| Other electrical equipment.....                  | 361-64,369     | 14                    | 74     | 463    | 1,371  | (D)    | (D)    | (D)    | (D)    | (D)     | (D)    | 477    |  |
| Transportation equipment.....                    | 37             | 20,784                | 20,865 | 19,262 | 17,097 | 12,570 | 11,202 | 10,617 | 10,392 | 13,130  | 12,202 | 12,251 |  |
| Motor vehicles and motor vehicles equipment..... | 371            | (D)                   | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)     | (D)    | (D)    |  |
| Other transportation equipment.....              | 373-75,379     | (D)                   | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)    | (D)     | (D)    | (D)    |  |
| Aircraft and missiles.....                       | 372,376        | 18,519                | 18,402 | 16,828 | 15,248 | 11,096 | (S)    | 9,372  | 8,794  | 11,462  | 10,515 | 10,619 |  |

See explanatory information and SOURCE at end of table.

Table A-13. Federal funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company  | SIC code                        | 1987                  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995      | 1996  | 1997      |  |
|---|---------------------------------|-----------------------|-------|-------|-------|-------|-------|-------|-------|-----------|-------|-----------|--|
|   |                                 | [Dollars in millions] |       |       |       |       |       |       |       |           |       |           |  |
| Distribution by industry:   |                                 |                       |       |       |       |       |       |       |       |           |       |           |  |
| Professional and scientific instruments....                                     | 38                              | 272                   | 191   | 263   | 737   | 1,865 | 2,221 | 2,577 | 3,384 | 3,460 (S) | 3,942 | 4,499     |  |
| Scientific and mechanical measuring instruments                                 | 381-82                          | (D)                   | (S)   | (S)   | (S)   | (D)   | 2,143 | 2,484 | 3,266 | 3,358 (S) | (D)   | 4,416     |  |
| Optical, surgical, photographic, and other instruments.....                     | 384-87                          | (D)                   | 95    | 101   | 87    | (D)   | 78    | 92    | 118   | 102       | (D)   | 84        |  |
| Other manufacturing industries <sup>1</sup> .....                               | 27,31,39                        | (D)                   | (D)   | (D)   | (D)   | (D)   | 61    | (D)   | (D)   | (D)       | (D)   | 156       |  |
| Nonmanufacturing <sup>2</sup> .....   |                                 | 2,700                 | 3,256 | 3,729 | 4,442 | 5,505 | 5,570 | 6,140 | 5,090 | 4,620     | 3,633 | 4,105     |  |
| Transportation and utilities.....   | 40-42,44-49                     | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 252       | 186   | 200       |  |
| Communications.....   | 48                              | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | (D)       | (D)   | (D)       |  |
| Telephone communications.....   | 481                             | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | (D)       | (D)   | (D)       |  |
| Other communications.....   | 482-484,489                     | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 0         | 0     | 0         |  |
| Electric, gas, and sanitary services.....                                       | 49                              | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 93        | 42    | (D)       |  |
| Other transportation and utilities.....   | 40-42,44-47                     | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | (D)       | (D)   | (D)       |  |
| Trade.....  | 50-59                           | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | (D)       | (D)   | (D)       |  |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | (D)       | (D)   | (D)       |  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 4,270     | 3,118 | 3,805     |  |
| Business services.....  | 73                              | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 612       | 361   | 400       |  |
| Computer and data processing services.....                                      | 737                             | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 514       | (D)   | 389       |  |
| Other business services.....  | 731-736,738                     | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 98        | (D)   | 11        |  |
| Health services.....  | 80                              | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 4         | (D)   | (D)       |  |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | (D)       | 3     | 4         |  |
| Other health services.....  | 802-805,808-809                 | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | (D)       | (D)   | (D)       |  |
| Engineering and management services.....  | 87                              | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 3,650     | 2,746 | 3,381 (S) |  |
| Engineering, architectural, and surveying.....                                  | 871                             | NA                    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 1,883     | 994   | 1,258     |  |

See explanatory information and SOURCE at end of table.

Table A-13. Federal funds for industrial R&amp;D performance, by industry and size of company: 1987-97

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| Industry and size of company                              | SIC code                     | 1987                  | 1988   | 1989   | 1990   | 1991   | 1992   | 1993   | 1994   | 1995      | 1996      | 1997   |  |
|---|------------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|-----------|-----------|--------|--|
|   |                              | [Dollars in millions] |        |        |        |        |        |        |        |           |           |        |  |
| Distribution by industry:                                 |                              |                       |        |        |        |        |        |        |        |           |           |        |  |
| Research, development, and testing.....                   | 873                          | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)       | 1,708 (S) | (D)    |  |
| Other engineering and management services.....            | 872,874                      | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | (D)       | 45        | (D)    |  |
| Other services.....                                       | 701,72,75-79,81,<br>83,84,89 | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 4         | (D)       | (D)    |  |
| Other nonmanufacturing industries <sup>1</sup> .....      | 07-12,14,15,<br>161-162,17   | NA                    | NA     | NA     | NA     | NA     | NA     | NA     | NA     | 11        | (D)       | 77     |  |
| Distribution by size of company:<br>[Number of employees] |                              |                       |        |        |        |        |        |        |        |           |           |        |  |
| Total.....  |                              | 30,752                | 30,343 | 28,554 | 28,125 | 26,372 | 24,722 | 22,809 | 22,463 | 23,451    | 23,653    | 23,928 |  |
| Fewer than 500.....                                       |                              | 963                   | 816    | 901    | 895    | 1,887  | 2,025  | 1,614  | 1,164  | 1,978     | 2,301     | 2,209  |  |
| 500 to 999.....   |                              | 115                   | 131    | 117    | (S)    | 181    | 151    | 182    | 182    | 225       | 219       | 376    |  |
| 1,000 to 4,999.....                                       |                              | 981                   | 1,093  | 958    | 881    | 1,050  | (S)    | 1,115  | 1,083  | 798       | 512       | 540    |  |
| 5,000 to 9,999.....                                       |                              | 748                   | 864    | 740    | 257    | 816    | 763    | 764    | 825    | 243       | 468       | 612    |  |
| 10,000 to 24,999.....                                     |                              | 2,362                 | 1,705  | 1,129  | 1,526  | 3,373  | 3,416  | 2,816  | 2,348  | 1,946 (S) | 1,031 (S) | 913    |  |
| 25,000 or more.....                                       |                              | 25,583                | 25,734 | 24,709 | 24,436 | 19,065 | 17,346 | 16,319 | 16,862 | 18,261    | 19,122    | 19,277 |  |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

<sup>2</sup> Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTE:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-14. Federal funds for industrial R&amp;D performance, by industry and size of company: 1997

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| Industry  | SIC code       | Total  | Size of company                |                            |                                |                                |                                  |                                |
|---|----------------|--------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                |        | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                |        | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| All Industries.....                                 |                | 23,928 | 2,209                          | 376                        | 540                            | 612                            | 913                              | 19,277                         |
| Manufacturing.....                                  |                | 19,823 | 396                            | 111                        | 325                            | (D)                            | 710                              | (D)                            |
| Food, kindred, and tobacco products.....            | 20,21          | 0      | 0                              | 0                          | 0                              | 0                              | 0                                | 0                              |
| Textiles and apparel.....                           | 22,23          | (D)    | 0                              | 0                          | 0                              | 0                              | 0                                | (D)                            |
| Lumber, wood products, and furniture.....           | 24,25          | 0      | 0                              | 0                          | 0                              | 0                              | 0                                | 0                              |
| Paper and allied products.....                      | 26             | (D)    | 0                              | 0                          | 0                              | 0                              | 0                                | (D)                            |
| Chemicals and allied products.....                  | 28             | (D)    | (D)                            | 0                          | 33                             | (D)                            | (D)                              | (D)                            |
| Industrial chemicals.....                           | 281-82,286     | (D)    | 0                              | 0                          | (D)                            | (D)                            | (D)                              | (D)                            |
| Drugs and medicines.....                            | 283            | 3 (S)  | (D)                            | 0                          | (D)                            | 0                              | 0                                | 0                              |
| Other chemicals.....                                | 284-85,287-89  | (D)    | 0                              | 0                          | (D)                            | 0                              | 0                                | 0                              |
| Petroleum refining and extraction.....              | 13,29          | (D)    | 0                              | 0                          | 0                              | 0                              | (D)                              | (D)                            |
| Rubber products.....                                | 30             | (D)    | 0                              | 0                          | (D)                            | (D)                            | 0                                | 0                              |
| Stone, clay, and glass products.....                | 32             | 2      | 0                              | 0                          | (D)                            | 0                              | (D)                              | 0                              |
| Primary metals.....                                 | 33             | 221    | (D)                            | (D)                        | (D)                            | 27                             | (D)                              | (D)                            |
| Ferrous metals and products.....                    | 331-32,3398-99 | (D)    | 0                              | 0                          | (D)                            | 27                             | (D)                              | (D)                            |
| Nonferrous metals and products.....                 | 333-36         | (D)    | (D)                            | (D)                        | (D)                            | 0                              | 0                                | (D)                            |
| Fabricated metal products.....                      | 34             | 129    | 84                             | (D)                        | (D)                            | (D)                            | (D)                              | 0                              |
| Machinery.....                                      | 35             | 106    | 6 (S)                          | (D)                        | (D)                            | 12                             | (D)                              | (D)                            |
| Office, computing, and accounting<br>machines.....  | 357            | 53     | 0                              | 0                          | (D)                            | (D)                            | 0                                | (D)                            |
| Other machinery, except electrical.....             | 351-56,358-59  | 53     | 6 (S)                          | (D)                        | (D)                            | (D)                            | (D)                              | (D)                            |
| Electrical equipment.....                           | 36             | 1,839  | 106                            | 31 (S)                     | 172                            | (D)                            | (D)                              | 1,508                          |
| Radio and TV receiving equipment.....               | 365            | (D)    | (D)                            | 0                          | (D)                            | 0                              | 0                                | 0                              |
| Communication equipment.....                        | 366            | (D)    | 27                             | (D)                        | (D)                            | (D)                            | 0                                | (D)                            |
| Electronic components.....                          | 367            | (D)    | (D)                            | 11 (S)                     | (D)                            | 0                              | (D)                              | (D)                            |
| Other electrical equipment.....                     | 361-64,369     | 477    | 62                             | (D)                        | (D)                            | (D)                            | 0                                | (D)                            |
| Transportation equipment.....                       | 37             | 12,251 | (D)                            | (D)                        | (D)                            | (D)                            | (D)                              | 11,736                         |
| Motor vehicles and motor vehicles<br>equipment..... | 371            | (D)    | 0                              | 0                          | 0                              | (D)                            | 0                                | (D)                            |

See explanatory information and SOURCE at end of table.

Table A-14. Federal funds for industrial R&amp;D performance, by industry and size of company: 1997

Page 2 of 3

| Industry  | SIC code                        | Total  | Size of company                |                            |                                |                                |                                  |                                |
|---|---------------------------------|--------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                                 |        | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                                 |        | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| Other transportation equipment.....   | 373-75,379                      | (D)    | 0                              | 0                          | 0                              | 0                              | 0                                | (D)                            |
| Aircraft and missiles.....  | 372,376                         | 10,619 | (D)                            | (D)                        | (D)                            | (D)                            | (D)                              | 10,120                         |
| Professional and scientific instruments.....                                    | 38                              | 4,499  | 37                             | 64                         | 73                             | (D)                            | (D)                              | (D)                            |
| Scientific and mechanical measuring instruments..                               | 381-82                          | 4,416  | 26                             | (D)                        | 63                             | (D)                            | (D)                              | (D)                            |
| Optical, surgical, photographic, and other instruments.....                     | 384-87                          | 84     | 11                             | (D)                        | 10                             | (D)                            | 0                                | (D)                            |
| Other manufacturing industries <sup>1</sup> .....                               | 27,31,39                        | 156    | (D)                            | 0                          | 0                              | 0                              | 0                                | (D)                            |
| Nonmanufacturing .....  |                                 | 4,105  | 1,813                          | 265                        | 215 (S)                        | (D)                            | 203                              | (D)                            |
| Transportation and utilities.....   | 40-42,44-49                     | 200    | 0                              | (D)                        | (D)                            | (D)                            | (D)                              | (D)                            |
| Communications.....   | 48                              | (D)    | 0                              | 0                          | 0                              | 0                              | 0                                | (D)                            |
| Telephone communications.....   | 481                             | (D)    | 0                              | 0                          | 0                              | 0                              | 0                                | (D)                            |
| Other communications.....   | 482-484,489                     | 0      | 0                              | 0                          | 0                              | 0                              | 0                                | 0                              |
| Electric, gas, and sanitary services.....                                       | 49                              | (D)    | 0                              | (D)                        | (D)                            | (D)                            | (D)                              | 0                              |
| Other transportation and utilities.....   | 40-42,44-47                     | (D)    | 0                              | 0                          | (D)                            | 0                              | (D)                              | 0                              |
| Trade.....  | 50-59                           | (D)    | 1                              | 0                          | (D)                            | 0                              | (D)                              | (D)                            |
| Finance, insurance, and real estate.....  | 60-65,67                        | (D)    | 0                              | 0                          | 0                              | (D)                            | 0                                | 0                              |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 3,805  | 1,738                          | (D)                        | (D)                            | 67 (S)                         | (D)                              | (D)                            |
| Business services.....  | 73                              | 400    | 313                            | (D)                        | 25                             | (D)                            | 0                                | (D)                            |
| Computer and data processing services...  | 737                             | 389    | (D)                            | (D)                        | 25                             | (D)                            | 0                                | (D)                            |
| Other business services.....  | 731-736,738                     | 11     | (D)                            | (D)                        | 0                              | 0                              | 0                                | 0                              |
| Health services.....  | 80                              | (D)    | 5                              | 0                          | 0                              | 0                              | (D)                              | 0                              |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | 4      | (D)                            | 0                          | 0                              | 0                              | (D)                              | 0                              |
| Other health services.....  | 802-805,808-809                 | (D)    | (D)                            | 0                          | 0                              | 0                              | 0                                | 0                              |

See explanatory information and SOURCE at end of table.

Table A-14. Federal funds for industrial R&amp;D performance, by industry and size of company: 1997

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| Industry   | SIC code                  | Total     | Size of company                |                            |                                |                                |                                  |                                |
|--|---------------------------|-----------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                           |           | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
| [Dollars in millions]                                |                           |           |                                |                            |                                |                                |                                  |                                |
| Engineering and management services.....             | 87                        | 3,381 (S) | 1,401                          | 256                        | (D)                            | (D)                            | (D)                              | (D)                            |
| Engineering, architectural, and surveying.....       | 871                       | 1,258     | 758                            | 147                        | (D)                            | 0                              | (D)                              | 0                              |
| Research, development, and testing.....              | 873                       | (D)       | (D)                            | 109                        | 0                              | 0                              | 0                                | (D)                            |
| Other engineering and management services....        | 872,874                   | (D)       | (D)                            | 0                          | 0                              | (D)                            | 0                                | 0                              |
| Other services.....                                  | 701,72,75-79,81, 83,84,89 | (D)       | (D)                            | 0                          | 0                              | 0                              | 0                                | 0                              |
| Other nonmanufacturing industries <sup>1</sup> ..... | 07-12,14,15, 161-162,17   | 77        | 74                             | 0                          | 0                              | (D)                            | 0                                | (D)                            |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.  
(S) = Indicates imputation of more than 50 percent.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-15. Federal funds for industrial R&amp;D performance, by selected agency and selected industry in selected years: 1977-97

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| Industry   | SIC code       | 1977                  | 1979   | 1981   | 1983   | 1985   | 1987   | 1989   | 1991   | 1993   | 1995      | 1997      |  |
|--|----------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|-----------|-----------|--|
|  |                | [Dollars in millions] |        |        |        |        |        |        |        |        |           |           |  |
| All agencies.....                                      | .....          | 10,485                | 12,518 | 16,382 | 20,680 | 27,196 | 30,752 | 28,554 | 26,372 | 22,809 | 23,451    | 23,928    |  |
| Chemicals and allied products.....                     | 28             | 295                   | 346    | 421    | 393    | 230    | 190    | 126    | 209    | (D)    | 210 (S)   | (D)       |  |
| Machinery.....   | 35             | 477                   | 335    | 694    | 1,116  | 1,495  | (D)    | (D)    | 1,055  | 88     | (D)       | (D)       |  |
| Electrical equipment.....                              | 36             | 2,648                 | 3,309  | 3,920  | 4,523  | 5,161  | 5,399  | 3,743  | 4,550  | 1,402  | 1,690     | 1,839     |  |
| Motor vehicles and other transportation equipment..... | 371,373-75,379 | (T)                   | (T)    | (T)    | (T)    | (T)    | (D)    | (D)    | (D)    | (D)    | (D)       | 1,632     |  |
| Aircraft and missiles.....                             | 372,376        | 5,486                 | 5,840  | 8,528  | 11,396 | 16,582 | 18,519 | 16,828 | 11,096 | 9,369  | 11,462    | 10,619    |  |
| Other industries <sup>1</sup> .....                    | --             | (T)                   | (T)    | (T)    | (T)    | (T)    | (T)    | (T)    | (D)    | 9,491  | 8,333     | 9,180     |  |
| DoD  |                |                       |        |        |        |        |        |        |        |        |           |           |  |
| Total.....   |                | 6,950                 | 7,939  | 10,540 | 14,571 | 20,948 | 22,252 | (S)    | (S)    | 15,044 | 13,876    | 12,603    |  |
| Chemicals and allied products.....                     | 28             | 32                    | 36     | 40     | 48     | (S)    | (D)    | (S)    | (D)    | (D)    | 139       | (D)       |  |
| Machinery.....   | 35             | 395                   | 541    | 599    | 963    | 1,287  | (D)    | (D)    | 748    | 58     | 47        | (D)       |  |
| Electrical equipment.....                              | 36             | 1,692                 | 1,920  | 2,338  | 3,057  | 3,812  | (S)    | 2,229  | (S)    | (D)    | 1,442 (S) | 1,565     |  |
| Motor vehicles and other transportation equipment..... | 371,373-75,379 | 382                   | (T)    | (T)    | (T)    | (D)    | (D)    | (D)    | (D)    | 888    | 1,199     | 1,166     |  |
| Aircraft and missiles.....                             | 372,376        | 3,900                 | 4,210  | 6,121  | 8,888  | 13,918 | 13,717 | (S)    | (S)    | 6,373  | 6,631 (S) | 4,989 (S) |  |
| Other industries <sup>1</sup> .....                    | --             | 461                   | (T)    | (T)    | (T)    | (D)    | (D)    | (D)    | (D)    | 5,707  | 4,418     | 4,637     |  |
| NASA   |                |                       |        |        |        |        |        |        |        |        |           |           |  |
| Total.....   |                | 1,697                 | 1,786  | 2,306  | 2,150  | (S)    | 2,805  | (S)    | (S)    | 435    | 2,054     | 2,022     |  |
| Chemicals and allied products.....                     | 28             | (T)                   | (T)    | (T)    | (T)    | (S)    | (D)    | 0      | (S)    | 2      | 4         | (D)       |  |
| Machinery.....   | 35             | 54                    | 74     | 81     | (T)    | (D)    | (D)    | (D)    | (D)    | (D)    | 2         | 1 (S)     |  |
| Electrical equipment.....                              | 36             | 208                   | 252    | 317    | 188    | 90     | 115    | (D)    | (S)    | (D)    | (D)       | 145       |  |
| Motor vehicles and other transportation equipment..... | 371,373-75,379 | (T)                   | (T)    | (T)    | (T)    | (T)    | (D)    | (D)    | (D)    | 20     | (D)       | (D)       |  |
| Aircraft and missiles.....                             | 372,376        | 1,348                 | 1,221  | 1,785  | 1,959  | (S)    | 2,650  | (S)    | (S)    | 236    | 985 (S)   | 1,060 (S) |  |
| Other industries <sup>1</sup> .....                    | --             | 44                    | 119    | 70     | (T)    | (D)    | (D)    | (D)    | (D)    | 137    | 946       | 708       |  |

See explanatory information and SOURCE at end of table.

Table A-15. Federal funds for industrial R&amp;D performance, by selected agency and selected industry in selected years: 1977-97

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| Industry   | SIC code       | 1977                  | 1979  | 1981  | 1983  | 1985  | 1987  | 1989  | 1991 | 1993  | 1995  | 1997  |  |
|--|----------------|-----------------------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|--|
|  |                | [Dollars in millions] |       |       |       |       |       |       |      |       |       |       |  |
| DOE  |                |                       |       |       |       |       |       |       |      |       |       |       |  |
| Total.....   |                | 2                     | 1,575 | 1,976 | 1,949 | 2,901 | 2,968 | 3,221 | (S)  | 2,961 | 3,547 | 2,505 |  |
| Chemicals and allied products.....                     | 28             | 2                     | (T)   | (T)   | (T)   | (S)   | 171   | (S)   | (S)  | (D)   | 40    | (D)   |  |
| Machinery.....   | 35             | 2                     | (T)   | (T)   | (T)   | (S)   | (D)   | (S)   | (D)  | (S)   | 31    | 38    |  |
| Electrical equipment.....                              | 36             | 2                     | 784   | 951   | 917   | 1,188 | 1,184 | 1,353 | (S)  | 57    | 72    | 42    |  |
| Motor vehicles and other transportation equipment..... | 371,373-75,379 | 2                     | 16    | 20    | (T)   | (T)   | (D)   | (D)   | (D)  | (D)   | 0     | (D)   |  |
| Aircraft and missiles.....                             | 372,376        | 2                     | 253   | 340   | 207   | 468   | 688   | (S)   | (S)  | (S)   | 2,498 | 1,307 |  |
| Other industries <sup>1</sup> .....                    | --             | 2                     | 287   | 356   | (T)   | (T)   | (D)   | (D)   | (D)  | 1,197 | 906   | 970   |  |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for all companies in this group are combined with those for companies in "Other industries." As a result, statistics for "Other industries" after 1995 are not comparable with statistics for prior years.

<sup>2</sup> Data was not tabulated for this agency prior to 1979.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

(T) = Not separately available but included in total.

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**NOTES:** Data for DoD, NASA, and DOE do not sum to the totals because the data reported by all other Federal agencies are not tabulated. In addition, Federal R&D data collected with each annual sample (on the RD-1A form) is not allocated by agency type.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-16. Total number of R&amp;D-performing companies and number reporting Federal R&amp;D funds, by industry and size of company: 1997

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| Industry  | SIC code       | Size of company |         |                          |         |                      |         |                          |         |                          |         |                            |         |
|---|----------------|-----------------|---------|--------------------------|---------|----------------------|---------|--------------------------|---------|--------------------------|---------|----------------------------|---------|
|   |                | Total           |         | Fewer than 500 employees |         | 500 to 999 employees |         | 1,000 to 4,999 employees |         | 5,000 to 9,999 employees |         | 10,000 to 24,999 employees |         |
|   |                | Total           | Federal | Total                    | Federal | Total                | Federal | Total                    | Federal | Total                    | Federal | Total                      | Federal |
| All Industries.....                             |                | 35,112          | 2,297   | 31,995                   | 2,106   | 1,127                | 46      | 1,302                    | 48      | 322                      | 34      | 199                        | 24      |
| Manufacturing.....                              |                | 18,130          | 683     | 15,898                   | 544     | 886                  | 31      | 938                      | 33      | 197                      | 25      | 138                        | 18      |
| Food, kindred, and tobacco products....         | 20,21          | 696             | 0       | 426                      | 0       | 112                  | 0       | 115                      | 0       | 17                       | 0       | 15                         | 0       |
| Textiles and apparel.....                       | 22,23          | 278             | 1       | 181                      | 0       | 44                   | 0       | 41                       | 0       | 3                        | 0       | 7                          | 0       |
| Lumber, wood products, and furniture .....      | 24,25          | 257             | 0       | 162                      | 0       | 52                   | 0       | 29                       | 0       | 10                       | 0       | 4                          | 0       |
| Paper and allied products.....                  | 26             | 121             | 2       | 57                       | 0       | 2                    | 0       | 41                       | 0       | 6                        | 0       | 9                          | 0       |
| Chemicals and allied products.....              | 28             | 602             | 15      | 424                      | 2       | 32                   | 0       | 95                       | 5       | 27                       | 3       | 17                         | 3       |
| Industrial chemicals.....                       | 281-82,286     | 161             | 11      | 91                       | 0       | 8                    | 0       | 42                       | 3       | 11                       | 3       | 7                          | 3       |
| Drugs and medicines.....                        | 283            | 199             | 3       | 159                      | 2       | 3                    | 0       | 22                       | 1       | 7                        | 0       | 5                          | 0       |
| Other chemicals.....                            | 284-85,287-89  | 242             | 1       | 174                      | 0       | 21                   | 0       | 32                       | 1       | 9                        | 0       | 5                          | 0       |
| Petroleum refining and extraction.....          | 13,29          | 26              | 3       | 2                        | 0       | 3                    | 0       | 11                       | 0       | 0                        | 0       | 7                          | 2       |
| Rubber products.....                            | 30             | 639             | 2       | 459                      | 0       | 93                   | 0       | 73                       | 1       | 7                        | 1       | 5                          | 0       |
| Stone, clay, and glass products.....            | 32             | 98              | 3       | 65                       | 0       | 10                   | 0       | 13                       | 2       | 5                        | 0       | 5                          | 1       |
| Primary metals.....                             | 33             | 250             | 14      | 126                      | 2       | 63                   | 1       | 31                       | 2       | 17                       | 5       | 10                         | 2       |
| Ferrous metals and products.....                | 331-32,3398-99 | 54              | 9       | 11                       | 0       | 4                    | 0       | 17                       | 1       | 14                       | 5       | 8                          | 2       |
| Nonferrous metals and products.....             | 333-36         | 196             | 5       | 116                      | 2       | 59                   | 1       | 14                       | 1       | 3                        | 0       | 2                          | 0       |
| Fabricated metal products.....                  | 34             | 903             | 55      | 731                      | 50      | 74                   | 1       | 74                       | 1       | 10                       | 2       | 11                         | 1       |
| Machinery.....                                  | 35             | 1,536           | 18      | 1,233                    | 5       | 108                  | 2       | 144                      | 2       | 28                       | 4       | 18                         | 3       |
| Office, computing, and accounting machines..... | 357            | 119             | 3       | 77                       | 0       | 10                   | 0       | 16                       | 1       | 8                        | 1       | 6                          | 0       |
| Other machinery, except electrical.....         | 351-56,358-59  | 1,417           | 15      | 1,156                    | 5       | 98                   | 2       | 128                      | 1       | 20                       | 3       | 12                         | 3       |
| Electrical equipment.....                       | 36             | 1,547           | 76      | 1,217                    | 36      | 140                  | 19      | 136                      | 9       | 33                       | 3       | 11                         | 3       |
| Radio and TV receiving equipment.....           | 365            | 19              | 2       | 14                       | 1       | 2                    | 0       | 3                        | 1       | 0                        | 0       | 0                          | 0       |
| Communication equipment.....                    | 366            | 322             | 12      | 255                      | 6       | 25                   | 2       | 23                       | 2       | 16                       | 1       | 0                          | 0       |
| Electronic components.....                      | 367            | 748             | 25      | 625                      | 2       | 60                   | 14      | 46                       | 5       | 10                       | 0       | 5                          | 3       |
| Other electrical equipment.....                 | 361-64,369     | 460             | 37      | 323                      | 27      | 54                   | 3       | 64                       | 1       | 7                        | 2       | 6                          | 0       |

See explanatory information and SOURCE at end of table.

Table A-16. Total number of R&amp;D-performing companies and number reporting Federal R&amp;D funds, by industry and size of company: 1997

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| Industry  | SIC code                        | Size of company |         |                          |         |                      |         |                          |         |                          |         |                            |         |                          |         |
|---|---------------------------------|-----------------|---------|--------------------------|---------|----------------------|---------|--------------------------|---------|--------------------------|---------|----------------------------|---------|--------------------------|---------|
|   |                                 | Total           |         | Fewer than 500 employees |         | 500 to 999 employees |         | 1,000 to 4,999 employees |         | 5,000 to 9,999 employees |         | 10,000 to 24,999 employees |         | 25,000 or more employees |         |
|   |                                 | Total           | Federal | Total                    | Federal | Total                | Federal | Total                    | Federal | Total                    | Federal | Total                      | Federal | Total                    | Federal |
| Transportation equipment.....                               | 37                              | 411             | 24      | 302                      | 2       | 54                   | 1       | 18                       | 3       | 14                       | 5       | 10                         | 1       | 13                       | 12      |
| Motor vehicles and motor vehicles equipment.....            | 371                             | 377             | 5       | 300                      | 0       | 51                   | 0       | 6                        | 0       | 8                        | 2       | 8                          | 0       | 4                        | 3       |
| Other transportation equipment.....                         | 373-75,379                      | 10              | 2       | 0                        | 0       | 2                    | 0       | 4                        | 0       | 1                        | 0       | 1                          | 0       | 2                        | 2       |
| Aircraft and missiles.....                                  | 372,376                         | 24              | 17      | 2                        | 2       | 1                    | 1       | 8                        | 3       | 5                        | 3       | 1                          | 1       | 7                        | 7       |
| Professional and scientific instruments.....                | 38                              | 760             | 75      | 611                      | 52      | 58                   | 7       | 74                       | 8       | 10                       | 2       | 3                          | 2       | 5                        | 4       |
| Scientific and mechanical measuring instruments.....        | 381-82                          | 515             | 54      | 440                      | 38      | 37                   | 6       | 29                       | 4       | 4                        | 1       | 2                          | 2       | 3                        | 3       |
| Optical, surgical, photographic, and other instruments..... | 384-87                          | 246             | 21      | 171                      | 14      | 21                   | 1       | 45                       | 4       | 6                        | 1       | 1                          | 0       | 2                        | 1       |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                        | 10,005          | 395     | 9,901                    | 394     | 40                   | 0       | 44                       | 0       | 10                       | 0       | 6                          | 0       | 4                        | 1       |
| Nonmanufacturing.....                                       |                                 | 16,982          | 1,614   | 16,097                   | 1,563   | 241                  | 15      | 364                      | 15      | 125                      | 9       | 61                         | 6       | 94                       | 6       |
| Transportation and utilities.....                           | 40-42,44-49                     | 417             | 10      | 204                      | 0       | 5                    | 1       | 65                       | 3       | 67                       | 2       | 10                         | 2       | 66                       | 2       |
| Communications.....   | 48                              | 90              | 2       | 24                       | 0       | 2                    | 0       | 4                        | 0       | 51                       | 0       | 0                          | 0       | 9                        | 2       |
| Telephone communications.....                               | 481                             | 59              | 2       | 0                        | 0       | 0                    | 0       | 0                        | 0       | 51                       | 0       | 0                          | 0       | 8                        | 2       |
| Other communications.....                                   | 482-484,489                     | 31              | 0       | 24                       | 0       | 2                    | 0       | 4                        | 0       | 0                        | 0       | 0                          | 0       | 1                        | 0       |
| Electric, gas, and sanitary services.....                   | 49                              | 161             | 6       | 77                       | 0       | 2                    | 1       | 57                       | 2       | 14                       | 2       | 9                          | 1       | 2                        | 0       |
| Other transportation and utilities.....                     | 40-42,44-47                     | 166             | 2       | 103                      | 0       | 1                    | 0       | 4                        | 1       | 2                        | 0       | 1                          | 1       | 55                       | 0       |
| Trade.....  | 50-59                           | 3,713           | 5       | 3,567                    | 2       | 14                   | 0       | 73                       | 1       | 20                       | 0       | 30                         | 1       | 10                       | 1       |
| Finance, insurance, and real estate.....                    | 60-65,67                        | 382             | 1       | 309                      | 0       | 31                   | 0       | 23                       | 0       | 9                        | 1       | 3                          | 0       | 7                        | 0       |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 4,891           | 822     | 4,482                    | 788     | 182                  | 14      | 179                      | 11      | 20                       | 4       | 17                         | 3       | 11                       | 2       |
| Business services.....                                      | 73                              | 2,455           | 139     | 2,276                    | 127     | 84                   | 4       | 65                       | 4       | 14                       | 3       | 5                          | 0       | 10                       | 1       |
| Computer and data processing services.....                  | 737                             | 2,273           | 136     | 2,144                    | 125     | 63                   | 3       | 51                       | 4       | 10                       | 3       | 3                          | 0       | 3                        | 1       |
| Other business services.....                                | 731-736,738                     | 181             | 3       | 133                      | 2       | 22                   | 1       | 14                       | 0       | 4                        | 0       | 2                          | 0       | 7                        | 0       |

See explanatory information and SOURCE at end of table.

Table A-16. Total number of R&amp;D-performing companies and number reporting Federal R&amp;D funds, by industry and size of company: 1997

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| Industry  | SIC code                     | Size of company |         |                          |         |                      |         |                          |         |                          |         |                            |         |                          |         |
|---|------------------------------|-----------------|---------|--------------------------|---------|----------------------|---------|--------------------------|---------|--------------------------|---------|----------------------------|---------|--------------------------|---------|
|   |                              | Total           |         | Fewer than 500 employees |         | 500 to 999 employees |         | 1,000 to 4,999 employees |         | 5,000 to 9,999 employees |         | 10,000 to 24,999 employees |         | 25,000 or more employees |         |
|   |                              | Total           | Federal | Total                    | Federal | Total                | Federal | Total                    | Federal | Total                    | Federal | Total                      | Federal | Total                    | Federal |
| Health services.....  | 80                           | 483             | 102     | 456                      | 101     | 3                    | 0       | 21                       | 0       | 0                        | 0       | 3                          | 1       | 0                        | 0       |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                  | 427             | 101     | 404                      | 100     | 3                    | 0       | 17                       | 0       | 0                        | 0       | 3                          | 1       | 0                        | 0       |
| Other health services.....  | 802-805,808-809              | 56              | 1       | 52                       | 1       | 0                    | 0       | 4                        | 0       | 0                        | 0       | 0                          | 0       | 0                        | 0       |
| Engineering and management services.....  | 87                           | 1,569           | 529     | 1,495                    | 508     | 42                   | 10      | 23                       | 7       | 3                        | 1       | 5                          | 2       | 1                        | 1       |
| Engineering, architectural, and surveying.....                                  | 871                          | 697             | 265     | 661                      | 251     | 14                   | 5       | 18                       | 7       | 1                        | 0       | 3                          | 2       | 0                        | 0       |
| Research, development, and testing.....   | 873                          | 727             | 262     | 711                      | 256     | 13                   | 5       | 2                        | 0       | 0                        | 0       | 0                          | 0       | 1                        | 1       |
| Other engineering and management services.....                                  | 872,874                      | 145             | 2       | 123                      | 1       | 15                   | 0       | 3                        | 0       | 2                        | 1       | 2                          | 0       | 0                        | 0       |
| Other services.....   | 701,72,75-79,81,<br>83,84,89 | 385             | 52      | 255                      | 52      | 53                   | 0       | 70                       | 0       | 3                        | 0       | 4                          | 0       | 0                        | 0       |
| Other nonmanufacturing industries <sup>1</sup> .....                            | 07-12,14,15,<br>161-162,17   | 7,579           | 776     | 7,535                    | 773     | 8                    | 0       | 24                       | 0       | 9                        | 2       | 1                          | 0       | 1                        | 1       |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-17. Industry-administered federally-funded R&D centers (FFRDCs) funds by character of work,  
full-time-equivalent (FTE) R&D scientists and engineers, and total number of employees: 1987-97**

| Item   | 1987   | 1988   | 1989   | 1990   | 1991   | 1992   | 1993   | 1994   | 1995   | 1996   | 1997   |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| [Dollars in millions]  |        |        |        |        |        |        |        |        |        |        |        |
| Total R&D funds.....   | 1,995  | 2,122  | 2,195  | 2,323  | 2,277  | 2,353  | 1,965  | 2,202  | 2,273  | 2,297  | 2,130  |
| Basic research.....  | 142    | 337    | 398    | 499    | 461    | 474    | 492    | 503    | 530    | 708    | 625    |
| Applied research.....  | 623    | 371    | 374    | 386    | 433    | 507    | 435    | 503    | 535    | 231    | 213    |
| Development.....   | 1,230  | 1,414  | 1,423  | 1,438  | 1,383  | 1,373  | 1,039  | 1,196  | 1,209  | 1,358  | 1,292  |
| [Employment]   |        |        |        |        |        |        |        |        |        |        |        |
| Number of FTE R&D<br>scientists and engineers <sup>1</sup> ..... | 8,432  | 10,994 | 11,618 | 12,438 | 11,977 | 11,770 | 8,083  | 8,362  | 9,033  | 8,696  | 8,324  |
| Total employment <sup>2</sup> .....                              | 33,804 | 36,143 | 35,716 | 42,153 | 39,697 | 40,755 | 23,930 | 23,905 | 24,031 | 21,735 | 20,391 |

<sup>1</sup> These data were recorded in January of the year following that listed.

<sup>2</sup> These data were recorded in March of the year listed.

**NOTE:** Industry-administered federally-funded research and development centers (FFRDCs) conduct R&D almost exclusively for use by the Federal Government. Data for these FFRDCs administered by industry are included in Federal R&D support shown in other tables under the industry classifications of the administering firms. See section C for a listing of industry-administered FFRDCs and their locations.

**Table A-18. Total (company, Federal, and other) funds for industrial R&D performance and number of R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1997**

| Distribution by size of company:<br>[Number of employees] | Total                    | Manufacturing | Nonmanufacturing |
|---|--------------------------|---------------|------------------|
|   | Funds for industrial R&D |               |                  |
|   | [Dollars in millions]    |               |                  |
| Total.....  | 157,539                  | 121,025       | 36,514           |
| Fewer than 500.....                                       | 24,063                   | 8,248         | 15,815           |
| 500 to 999.....   | 4,966                    | 2,905         | 2,061            |
| 1,000 to 4,999.....                                       | 19,590                   | 14,300        | 5,289            |
| 5,000 to 9,999.....                                       | 14,266                   | 11,670        | 2,596            |
| 10,000 to 24,999.....                                     | 21,510                   | 16,874        | 4,636            |
| 25,000 or more.....                                       | 73,144                   | 67,028        | 6,116            |
| Number of R&D-performing companies                        |                          |               |                  |
| Total.....  | 35,112                   | 18,130        | 16,982           |
| Fewer than 500.....                                       | 31,995                   | 15,898        | 16,097           |
| 500 to 999.....   | 1,127                    | 886           | 241              |
| 1,000 to 4,999.....                                       | 1,302                    | 938           | 364              |
| 5,000 to 9,999.....                                       | 322                      | 197           | 125              |
| 10,000 to 24,999.....                                     | 199                      | 138           | 61               |
| 25,000 or more.....                                       | 167                      | 73            | 94               |

**SOURCE:** National Science Foundation/Divison of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-19. Concentration of total, Federal, and company and other industrial R&D funds and net sales of R&D-performing companies, by size of R&D program: 1987-97**

| Companies ranked by size of R&D program                  | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|--|------|------|------|------|------|------|------|------|------|------|------|
| Percent of total (company, Federal, and other) R&D funds |      |      |      |      |      |      |      |      |      |      |      |
| First 4 (1-4).....                                       | 19   | 18   | 19   | 18   | 16   | 15   | 17   | 15   | 16   | 15   | 14   |
| Next 4 (5-8).....  | 12   | 12   | 13   | 13   | 8    | 8    | 7    | 8    | 8    | 8    | 8    |
| Next 12 (9-20)....                                       | 16   | 17   | 16   | 15   | 12   | 13   | 13   | 14   | 13   | 13   | 13   |
| Next 20 (21-40)....                                      | 12   | 12   | 12   | 12   | 11   | 11   | 12   | 13   | 12   | 12   | 11   |
| Next 60 (41-100)..                                       | 14   | 15   | 15   | 16   | 15   | 15   | 16   | 15   | 14   | 14   | 14   |
| Next 100 (101-200)                                       | 8    | 8    | 8    | 9    | 12   | 12   | 8    | 9    | 8    | 9    | 9    |
| Next 200 (201-400) ..                                    | 6    | 7    | 6    | 7    | 6    | 6    | 7    | 7    | 7    | 7    | 8    |
| Percent of Federal R&D funds                             |      |      |      |      |      |      |      |      |      |      |      |
| First 4 (1-4).....                                       | 31   | 31   | 36   | 38   | 14   | 11   | 23   | 26   | 35   | 37   | 40   |
| Next 4 (5-8).....  | 18   | 18   | 15   | 16   | 21   | 18   | 17   | 19   | 19   | 20   | 23   |
| Next 12 (9-20)....                                       | 27   | 27   | 30   | 26   | 21   | 27   | 32   | 32   | 27   | 23   | 18   |
| Next 20 (21-40)....                                      | 15   | 15   | 11   | 12   | 15   | 13   | 16   | 13   | 8    | 7    | 7    |
| Next 60 (41-100)..                                       | 7    | 6    | 6    | 6    | 13   | 11   | 5    | 7    | 5    | 5    | 5    |
| Next 100 (101-200)                                       | 1    | 3    | 1    | 1    | 3    | 4    | 5    | 2    | 3    | 4    | 3    |
| Next 200 (201-400) ..                                    | 0    | 0    | 0    | 0    | 2    | 2    | 2    | 1    | 3    | 4    | 4    |
| Percent of company and other (except Federal) R&D funds  |      |      |      |      |      |      |      |      |      |      |      |
| First 4 (1-4)...   | 20   | 21   | 22   | 21   | 17   | 17   | 17   | 16   | 16   | 15   | 13   |
| Next 4 (5-8).....  | 7    | 7    | 7    | 7    | 7    | 8    | 7    | 7    | 7    | 7    | 7    |
| Next 12 (9-20)....                                       | 12   | 12   | 13   | 12   | 10   | 12   | 12   | 12   | 11   | 11   | 11   |
| Next 20 (21-40)...                                       | 11   | 12   | 12   | 13   | 10   | 11   | 11   | 11   | 11   | 10   | 11   |
| Next 60 (41-100) ..                                      | 16   | 16   | 16   | 17   | 16   | 17   | 14   | 14   | 14   | 14   | 13   |
| Next 100 (101-200)                                       | 10   | 10   | 10   | 10   | 15   | 14   | 9    | 9    | 9    | 10   | 10   |
| Next 200 (201-400). .                                    | 8    | 8    | 8    | 8    | 7    | 7    | 8    | 8    | 8    | 8    | 9    |
| Percent of net sales ranked by size of total R&D funds   |      |      |      |      |      |      |      |      |      |      |      |
| First 4 (1-4).....                                       | 7    | 7    | 6    | 8    | 7    | 8    | 8    | 8    | 8    | 6    | 6    |
| Next 4 (5-8).....  | 5    | 5    | 5    | 4    | 3    | 3    | 3    | 2    | 2    | 3    | 2    |
| Next 12 (9-20)....                                       | 5    | 5    | 5    | 5    | 4    | 4    | 4    | 5    | 6    | 6    | 5    |
| Next 20 (21-40)....                                      | 7    | 6    | 5    | 5    | 4    | 4    | 4    | 5    | 4    | 4    | 5    |
| Next 60 (41-100) ..                                      | 11   | 11   | 12   | 12   | 12   | 12   | 11   | 10   | 9    | 8    | 7    |
| Next 100 (101-200) ..                                    | 8    | 9    | 8    | 9    | 9    | 9    | 8    | 8    | 8    | 11   | 8    |
| Next 200 (201-400)....                                   | 12   | 10   | 11   | 12   | 11   | 11   | 10   | 10   | 10   | 11   | 13   |

**NOTES:** Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-20. Domestic net sales of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry   | SIC code       | Total     | Size of company                |                            |                                |                                |                                  |                                |
|--|----------------|-----------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                |           | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                |           | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| 1996   |                |           |                                |                            |                                |                                |                                  |                                |
| All Industries.....                                |                | 4,076,076 | 339,405                        | 147,701                    | 618,426                        | 422,915                        | 791,806                          | 1,755,822                      |
| Manufacturing.....                                 |                | 2,765,725 | 201,551                        | 109,851                    | 419,199                        | 286,671                        | 600,657                          | 1,147,797                      |
| Food, kindred, and tobacco products.....           | 20,21          | 350,424   | 17,940                         | 15,549                     | 55,728                         | 39,762                         | 50,258                           | 171,186                        |
| Textiles and apparel.....                          | 22,23          | 50,569    | 5,580                          | (D)                        | 13,795                         | 5,015                          | 16,958                           | (D)                            |
| Lumber, wood products, and furniture.....          | 24,25          | 46,587    | 5,167                          | (D)                        | 11,230                         | 9,687                          | 9,325                            | (D)                            |
| Paper and allied products.....                     | 26             | 132,978   | 3,297                          | 1,097                      | 22,488                         | 9,445                          | 39,157                           | 57,493                         |
| Chemicals and allied products.....                 | 28             | 332,229   | 14,882                         | 10,517                     | 64,808                         | 50,477                         | 94,658                           | 96,887                         |
| Industrial chemicals.....                          | 281-82,286     | 142,755   | 4,902                          | 7,083                      | 27,502                         | 15,716                         | 49,707                           | 37,845                         |
| Drugs and medicines.....                           | 283            | 97,142    | 1,298                          | (D)                        | 14,776                         | 14,444                         | 34,201                           | (D)                            |
| Other chemicals.....                               | 284-85,287-89  | 92,333    | 8,682                          | (D)                        | 22,530                         | 20,317                         | 10,749                           | (D)                            |
| Petroleum refining and extraction.....             | 13,29          | 248,815   | 4,025                          | (D)                        | 10,086                         | (D)                            | 142,384                          | 90,492                         |
| Rubber products.....                               | 30             | 70,598    | 11,699                         | 9,496                      | 23,791                         | (D)                            | 5,869                            | (D)                            |
| Stone, clay, and glass products.....               | 32             | 37,429    | 3,830                          | 1,766                      | 9,761                          | 6,374                          | 15,698                           | 0                              |
| Primary metals.....                                | 33             | 103,908   | 6,473                          | (D)                        | 18,436                         | 21,358                         | (D)                              | 34,436                         |
| Ferrous metals and products.....                   | 331-32,3398-99 | 60,179    | 3,793                          | (D)                        | 8,802                          | 15,530                         | (D)                              | (D)                            |
| Nonferrous metals and products.....                | 333-36         | 43,729    | 2,680                          | (D)                        | 9,635                          | 5,828                          | 12,386                           | (D)                            |
| Fabricated metal products.....                     | 34             | 95,343    | 15,960                         | (D)                        | 21,694                         | 13,931                         | 25,781                           | (D)                            |
| Machinery.....                                     | 35             | 259,426   | 31,320                         | (D)                        | 55,447                         | 37,834                         | 70,245                           | (D)                            |
| Office, computing, and accounting<br>machines..... | 357            | 81,929    | 3,045                          | (D)                        | 9,976                          | 8,893                          | 27,360                           | (D)                            |
| Other machinery, except electrical.....            | 351-56,358-59  | 177,497   | 28,275                         | (D)                        | 45,471                         | 28,941                         | 42,884                           | (D)                            |
| Electrical equipment.....                          | 36             | 334,058   | 27,254                         | 17,217                     | 60,027                         | 33,196                         | 47,683                           | 148,680                        |
| Radio and TV receiving equipment.....              | 365            | 7,064     | 1,302                          | 875                        | (D)                            | (D)                            | 0                                | 0                              |
| Communication equipment.....                       | 366            | 51,140    | 6,075                          | 3,510                      | (D)                            | (D)                            | (D)                              | (D)                            |
| Electronic components.....                         | 367            | 146,303   | 9,842                          | 6,691                      | 26,665                         | 16,164                         | 16,723                           | 70,218                         |
| Other electrical equipment.....                    | 361-64,369     | 129,551   | 10,034                         | 6,142                      | 17,117                         | 6,049                          | (D)                              | (D)                            |
| Transportation equipment.....                      | 37             | 500,269   | 3,357                          | 3,636                      | 13,572                         | 30,538                         | 45,175                           | 403,992                        |
| Motor vehicles and motor vehicles<br>equipment..   | 371            | 348,614   | (D)                            | (D)                        | 5,876                          | 24,879                         | 40,050                           | 273,012                        |

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry  | SIC code                        | Total     | Size of company                |                            |                                |                                |                                  |                                |
|---|---------------------------------|-----------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                                 |           | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                                 |           | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| 1996  |                                 |           |                                |                            |                                |                                |                                  |                                |
| Other transportation equipment.....   | 373-75,379                      | 25,444    | (D)                            | 0                          | 4,619                          | (D)                            | (D)                              | 15,984                         |
| Aircraft and missiles.....  | 372,376                         | 126,211   | 1,643 (S)                      | (D)                        | 3,078                          | (D)                            | (D)                              | 114,997                        |
| Professional and scientific instruments.....                                    | 38                              | 105,999   | 13,450                         | 6,662                      | 25,613                         | 10,784                         | (D)                              | (D)                            |
| Scientific and mechanical measuring instruments...                              | 381-82                          | 48,652    | 7,103                          | 4,668                      | 9,732                          | 3,365                          | (D)                              | (D)                            |
| Optical, surgical, photographic, and other instruments.....                     | 384-87                          | 57,346    | 6,348                          | 1,994                      | 15,882                         | 7,419                          | (D)                              | (D)                            |
| Other manufacturing industries <sup>1</sup> .....                               | 27,31,39                        | 97,093    | 37,318                         | 6,174                      | 12,721                         | 9,826                          | 11,700                           | 19,354                         |
| Nonmanufacturing .....  |                                 | 1,310,352 | 137,855                        | 37,851                     | 199,227                        | 136,244                        | 191,149                          | 608,026                        |
| Transportation and utilities.....   | 40-42,44-49                     | 456,861   | 6,367                          | 1,050                      | 52,647                         | 53,346                         | 67,492                           | 275,960                        |
| Communications.....   | 48                              | 211,857   | 3,419                          | (D)                        | (D)                            | (D)                            | 0                                | (D)                            |
| Telephone communications.....   | 481                             | 206,298   | 0                              | 0                          | 0                              | (D)                            | 0                                | (D)                            |
| Other communications.....   | 482-484,489                     | 5,559     | 3,419                          | (D)                        | (D)                            | 0                              | 0                                | 0                              |
| Electric, gas, and sanitary services.....                                       | 49                              | 182,121   | 802                            | (D)                        | 46,126                         | 50,330                         | (D)                              | (D)                            |
| Other transportation and utilities.....   | 40-42,44-47                     | 62,884    | 2,146                          | 0                          | (D)                            | (D)                            | (D)                              | 49,177                         |
| Trade.....  | 50-59                           | 274,435   | 40,249                         | 21,139                     | 31,143                         | 38,012                         | 32,368                           | 111,523                        |
| Finance, insurance, and real estate.....  | 60-65,67                        | 296,786   | 3,271                          | 905                        | 72,094                         | 20,624                         | (D)                              | (D)                            |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 235,129   | 68,045                         | 12,544                     | 36,407                         | 13,258                         | 79,343                           | 25,533                         |
| Business services.....  | 73                              | 103,818   | 24,615                         | 8,619                      | 20,320                         | 10,065                         | 21,916                           | 18,283                         |
| Computer and data processing services .....                                     | 737                             | 81,079    | 22,761                         | 8,072                      | 17,617                         | 6,508                          | (D)                              | (D)                            |
| Other business services.....  | 731-736,738                     | 22,739    | 1,853                          | 546                        | 2,702                          | 3,558                          | (D)                              | (D)                            |
| Health services.....  | 80                              | 12,403    | 1,564                          | (D)                        | 1,097                          | (D)                            | 8,616                            | 0                              |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | 11,740    | 1,473                          | (D)                        | (D)                            | 0                              | 8,616                            | 0                              |
| Other health services.....  | 802-805,808-809                 | 663       | 91                             | (D)                        | (D)                            | (D)                            | 0                                | 0                              |

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry   | SIC code                  | Total     | Size of company                |                            |                                |                                |                                  |                                |
|--|---------------------------|-----------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                           |           | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                           |           | [Dollars in millions]          |                            |                                |                                |                                  |                                |
|  |                           |           | 1996                           |                            |                                |                                |                                  |                                |
| Engineering and management services.....             | 87                        | 75,448    | 40,403                         | 2,523                      | 12,664                         | (D)                            | 15,390                           | (D)                            |
| Engineering, architectural, and surveying.....       | 871                       | 26,724    | 5,464                          | 782                        | 6,883                          | (D)                            | (D)                              | 0                              |
| Research, development, and testing.....              | 873                       | 39,127    | 32,882                         | 1,056                      | (D)                            | 0                              | (D)                              | (D)                            |
| Other engineering and management services...         | 872,874                   | 9,598     | 2,057                          | 685                        | (D)                            | 0                              | (D)                              | 0                              |
| Other services.....                                  | 701,72,75-79,81, 83,84,89 | 43,460    | 1,463                          | (D)                        | 2,326                          | (D)                            | 33,420                           | (D)                            |
| Other nonmanufacturing industries <sup>1</sup> ..... | 07-12,14,15, 161-162,17   | 47,141    | 19,922                         | 2,213                      | 6,937                          | 11,004                         | (D)                              | (D)                            |
| 1997   |                           |           |                                |                            |                                |                                |                                  |                                |
| All Industries.....                                  |                           | 4,573,376 | 383,693                        | 164,954                    | 730,532                        | 579,895                        | 839,149                          | 1,875,152                      |
| Manufacturing.....                                   |                           | 3,084,508 | 251,504                        | 138,267                    | 534,768                        | 348,135                        | 627,198                          | 1,184,636                      |
| Food, kindred, and tobacco products.....             | 20,21                     | 363,454   | 16,182                         | 21,131                     | 54,019                         | 44,600                         | 80,506                           | 147,015                        |
| Textiles and apparel.....                            | 22,23                     | 50,725    | 5,703                          | 3,953                      | 13,939                         | (D)                            | 14,880                           | (D)                            |
| Lumber, wood products, and furniture.....            | 24,25                     | 40,866    | 3,752                          | 4,874                      | 11,246                         | 12,075                         | 8,920                            | 0                              |
| Paper and allied products.....                       | 26                        | 134,028   | (D)                            | (D)                        | 21,084                         | 10,439                         | 41,537                           | 56,961                         |
| Chemicals and allied products.....                   | 28                        | 349,944   | 18,911                         | 9,519                      | 72,441                         | 69,419                         | 94,026                           | 85,627                         |
| Industrial chemicals.....                            | 281-82,286                | 142,139   | 4,868                          | (D)                        | 34,394                         | 31,571                         | 36,129                           | (D)                            |
| Drugs and medicines.....                             | 283                       | 110,054   | 3,681                          | 643                        | 16,007                         | 17,871                         | 36,120                           | 35,732                         |
| Other chemicals.....                                 | 284-85,287-89             | 97,751    | 10,363                         | (D)                        | 22,040                         | 19,977                         | 21,777                           | (D)                            |
| Petroleum refining and extraction.....               | 13,29                     | 282,521   | 230                            | 1,767                      | 96,006                         | 0                              | 107,154                          | 77,365                         |
| Rubber products.....                                 | 30                        | 99,225    | 40,494                         | 7,945                      | 24,071                         | (D)                            | 7,492                            | (D)                            |
| Stone, clay, and glass products.....                 | 32                        | 32,914    | (D)                            | (D)                        | 5,376                          | 6,559                          | 17,692                           | (D)                            |
| Primary metals.....                                  | 33                        | 133,940   | 5,937                          | 18,118                     | 23,200                         | 21,734                         | 30,752                           | 34,199                         |
| Ferrous metals and products.....                     | 331-32,3398-99            | 72,704    | 668                            | 245                        | 9,980                          | 17,755                         | (D)                              | (D)                            |
| Nonferrous metals and products.....                  | 333-36                    | 61,237    | 5,269                          | 17,873                     | 13,220                         | 3,979                          | (D)                              | (D)                            |

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry   | SIC code      | Total     | Size of company                |                            |                                |                                |                                  |                                |
|--|---------------|-----------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |               |           | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |               |           | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| 1997   |               |           |                                |                            |                                |                                |                                  |                                |
| Fabricated metal products.....                                 | 34            | 109,918   | 19,213                         | (D)                        | 23,368                         | 14,086                         | 30,142                           | (D)                            |
| Machinery.....   | 35            | 327,764   | 37,523                         | 15,445                     | 65,741                         | 54,395                         | 71,441                           | 83,220                         |
| Office, computing, and accounting<br>machines...               | 357           | 139,516   | 6,977                          | 2,068                      | 15,456                         | 24,264                         | (D)                              | (D)                            |
| Other machinery, except electrical.....                        | 351-56,358-59 | 188,248   | 30,546                         | 13,377                     | 50,285                         | 30,131                         | (D)                              | (D)                            |
| Electrical equipment.....                                      | 36            | 397,253   | 28,704                         | 16,196                     | 66,144                         | 62,265                         | 47,129                           | 176,815                        |
| Radio and TV receiving equipment.....                          | 365           | 5,896     | (D)                            | (D)                        | 4,164                          | 0                              | 0                                | 0                              |
| Communication equipment.....                                   | 366           | 92,058    | 8,134                          | (D)                        | 11,670                         | 33,750                         | 0                                | (D)                            |
| Electronic components.....                                     | 367           | 132,461   | (D)                            | 5,708                      | 23,625                         | 21,217                         | 25,467                           | (D)                            |
| Other electrical equipment.....                                | 361-64,369    | 166,838   | 5,380                          | 6,760                      | 26,685                         | 7,298                          | 21,662                           | 99,053                         |
| Transportation equipment.....                                  | 37            | 516,738   | 7,829                          | 13,846                     | 12,106                         | 18,329                         | 50,569                           | 414,060                        |
| Motor vehicles and motor vehicles<br>equipment.....            | 371           | 357,701   | (D)                            | 13,415                     | 5,180                          | (D)                            | 44,553                           | (D)                            |
| Other transportation equipment.....                            | 373-75,379    | 14,141    | 0                              | (D)                        | 1,405                          | (D)                            | (D)                              | (D)                            |
| Aircraft and missiles.....                                     | 372,376       | 144,896   | (D)                            | (D)                        | 5,521                          | 6,612                          | (D)                              | 128,270                        |
| Professional and scientific instruments.....                   | 38            | 115,938   | 13,350                         | 7,552                      | 27,986                         | 11,802                         | 7,410                            | 47,839                         |
| Scientific and mechanical measuring<br>instruments...          | 381-82        | 57,158    | 9,294                          | 4,628                      | 9,730                          | 4,591                          | (D)                              | (D)                            |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87        | 58,781    | 4,056                          | 2,924                      | 18,256                         | 7,211                          | (D)                              | (D)                            |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39      | 129,277   | 48,438                         | 6,914                      | 18,042                         | 13,506                         | 17,549                           | 24,827                         |
| Nonmanufacturing .....   |               | 1,488,869 | 132,189                        | 26,688                     | 195,764                        | 231,761                        | 211,951                          | 690,517                        |
| Transportation and utilities.....                              | 40-42,44-49   | 661,667   | 2,944                          | 488                        | 66,140                         | 122,019                        | 71,882                           | 398,195                        |
| Communications.....  | 48            | 278,724   | 926                            | (D)                        | 1,568                          | 72,524                         | 0                                | (D)                            |
| Telephone communications.....                                  | 481           | 270,988   | 0                              | 0                          | 0                              | 72,524                         | 0                                | 198,463                        |
| Other communications.....                                      | 482-484,489   | 7,737     | 926                            | (D)                        | 1,568                          | 0                              | 0                                | (D)                            |
| Electric, gas, and sanitary services.....                      | 49            | 188,859   | 788                            | (D)                        | 59,399                         | (D)                            | (D)                              | (D)                            |
| Other transportation and utilities.....                        | 40-42,44-47   | 194,084   | 1,230                          | (D)                        | 5,173                          | (D)                            | (D)                              | 181,615                        |

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry  | SIC code                        | Total   | Size of company                |                            |                                |                                |                                  |                                |
|---|---------------------------------|---------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                                 |         | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                                 |         | [Dollars in millions]          |                            |                                |                                |                                  |                                |
| 1997  |                                 |         |                                |                            |                                |                                |                                  |                                |
| Trade.....  | 50-59                           | 331,046 | 68,434                         | 4,034                      | 47,493                         | 49,877                         | 55,380                           | 105,828                        |
| Finance, insurance, and real estate.....  | 60-65, 67                       | 226,679 | 3,403                          | 4,202                      | 29,748                         | 19,579                         | 14,182                           | 155,565                        |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 216,994 | 45,194                         | 17,004                     | 43,889                         | 16,847                         | (D)                              | (D)                            |
| Business services.....  | 73                              | 106,900 | 25,892                         | 7,869                      | 23,221                         | 11,742                         | 14,985                           | 23,191                         |
| Computer and data processing<br>services.. ..   | 737                             | 85,170  | 24,721                         | 6,791                      | 20,425                         | (D)                            | (D)                              | 12,936                         |
| Other business services.....  | 731-736,738                     | 21,730  | 1,172                          | 1,078                      | 2,796                          | (D)                            | (D)                              | 10,255                         |
| Health services.....  | 80                              | 13,039  | 1,422                          | 641                        | 3,059                          | 0                              | 7,918 (S)                        | 0                              |
| Offices and clinics of medical<br>doctors, hospitals,<br>medical and dental labs..... | 801,806,807                     | 11,983  | 1,180                          | 641                        | 2,244                          | 0                              | 7,918 (S)                        | 0                              |
| Other health services.....  | 802-805,808-809                 | 1,056   | 242                            | 0                          | 815                            | 0                              | 0                                | 0                              |
| Engineering and management services.....  | 87                              | 54,588  | 14,890                         | 4,985                      | 8,143                          | (D)                            | 20,425                           | (D)                            |
| Engineering, architectural, and<br>surveying.....                                     | 871                             | 29,944  | 6,446                          | 1,473                      | 6,309                          | (D)                            | (D)                              | 0                              |
| Research, development, and testing.....   | 873                             | 12,407  | 7,190                          | 1,765                      | 370                            | (D)                            | 0                                | (D)                            |
| Other engineering and management<br>services.....                                     | 872, 874                        | 12,237  | 1,254                          | 1,746                      | 1,465                          | (D)                            | (D)                              | 0                              |
| Other services.....   | 701,72,75-79,81,<br>83,84,89    | 42,466  | 2,990                          | 3,510                      | 9,466                          | (D)                            | (D)                              | 0                              |
| Other nonmanufacturing industries <sup>1</sup> .....                                  | 07-12,14,15,<br>161-162,17      | 52,482  | 12,213                         | 960                        | 8,493                          | 23,439                         | (D)                              | (D)                            |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-21. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in  
R&D-performing companies, by industry and size of company: 1987-97**

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| Industry and size of company                     | SIC code       | 1987      | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |  |
|--|----------------|-----------|------|------|------|------|------|------|------|------|------|------|--|
|  |                | [Percent] |      |      |      |      |      |      |      |      |      |      |  |
| All Industries <sup>1</sup> .....                |                | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 3.4  | 3.5  | 3.4  |  |
| Distribution by industry:                        |                |           |      |      |      |      |      |      |      |      |      |      |  |
| Manufacturing.....                               |                | 4.6       | 4.5  | 4.3  | 4.0  | 4.2  | 4.2  | 3.8  | 3.6  | 3.6  | 4.0  | 3.9  |  |
| Food, kindred, and tobacco products.....         | 20,21          | 0.6       | (D)  | (D)  | (D)  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.4  | 0.5  |  |
| Textiles and apparel.....                        | 22,23          | (D)       | (D)  | (D)  | (D)  | 0.6  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  |  |
| Lumber, wood products, and furniture.....        | 24,25          | 0.6       | (D)  | 0.6  | 0.6  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | 0.9  |  |
| Paper and allied products.....                   | 26             | (D)       | (D)  | 0.8  | 1.0  | 1.1  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  |  |
| Chemicals and allied products.....               | 28             | 5.3       | 5.3  | 5.4  | 5.3  | 5.4  | 5.5  | (D)  | (D)  | 4.7  | (D)  | (D)  |  |
| Industrial chemicals.....                        | 281-82,286     | 4.7       | 4.4  | 4.2  | 4.5  | 4.6  | 4.6  | (D)  | (D)  | (D)  | (D)  | (D)  |  |
| Drugs and medicines.....                         | 283            | (D)       | 8.8  | (D)  | (D)  | 8.9  | 9.6  | 12.5 | 10.2 | 10.4 | 10.1 | 10.5 |  |
| Other chemicals.....                             | 284-85,287-89  | (D)       | 3.4  | (D)  | (D)  | 3.1  | 2.7  | (D)  | (D)  | (D)  | 2.7  | (D)  |  |
| Petroleum refining and extraction.....           | 13,29          | 1.0       | 1.0  | 0.9  | 0.9  | 1.0  | 0.9  | 0.9  | 0.8  | 0.7  | 0.7  | (D)  |  |
| Rubber products.....                             | 30             | (D)       | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  |  |
| Stone, clay, and glass products.....             | 32             | 2.6       | (D)  | (D)  | (D)  | (D)  | (D)  | 1.5  | 1.7  | 1.5  | 1.3  | 1.8  |  |
| Primary metals.....                              | 33             | 0.9       | 0.8  | 0.8  | 0.8  | 0.8  | 0.6  | 0.7  | 0.6  | 0.5  | (D)  | 0.7  |  |
| Ferrous metals and products.....                 | 331-32,3398-99 | (D)       | 0.5  | (D)  | (D)  | (D)  | (D)  | 0.5  | (D)  | (D)  | (D)  | (D)  |  |
| Nonferrous metals and products.....              | 333-36         | (D)       | 1.0  | (D)  | (D)  | (D)  | (D)  | 1.2  | (D)  | (D)  | (D)  | (D)  |  |
| Fabricated metal products.....                   | 34             | 1.5       | 1.3  | 1.5  | 1.4  | 1.5  | 1.5  | 1.4  | 1.2  | 1.1  | (D)  | 1.6  |  |
| Machinery.....                                   | 35             | (D)       | 7.7  | 7.9  | 7.7  | 8.1  | 7.8  | 4.6  | 3.8  | (D)  | 5.2  | 5.6  |  |
| Office, computing, and accounting machines....   | 357            | (D)       | (D)  | (D)  | (D)  | (D)  | (D)  | 9.9  | 7.9  | (D)  | (D)  | 9.2  |  |
| Other machinery, except electrical.....          | 351-56,358-59  | 3.0       | 2.9  | (D)  | (D)  | (D)  | (D)  | 2.6  | 2.5  | 2.4  | (D)  | 3.0  |  |
| Electrical equipment.....                        | 36             | 8.2       | 7.5  | 7.3  | 6.5  | 6.5  | 5.6  | 6.2  | 5.9  | 6.0  | 6.7  | 6.2  |  |
| Radio and TV receiving equipment.....            | 365            | 3.2       | 2.4  | 1.8  | 1.6  | (D)  |  |
| Communication equipment.....                     | 366            | 10.2      | 10.7 | 11.6 | 10.0 | (D)  |  |
| Electronic components.....                       | 367            | 10.0      | 9.0  | (D)  | 8.3  | 7.9  | 7.5  | 8.1  | 7.5  | (D)  | (D)  | (D)  |  |
| Other electrical equipment.....                  | 361-64,369     | 2.7       | 2.5  | (D)  | 3.7  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | 2.9  |  |
| Transportation equipment.....                    | 37             | 8.7       | 8.9  | 8.1  | 7.5  | 7.3  | 7.1  | 6.4  | 5.9  | 6.1  | 6.5  | 6.2  |  |
| Motor vehicles and motor vehicles equipment..... | 371            | (D)       | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  |  |
| Other transportation equipment.....              | 373-75,379     | (D)       | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  |  |
| Aircraft and missiles.....                       | 372,376        | 14.7      | 16.3 | 13.5 | 11.8 | 12.1 | 11.8 | 12.5 | 13.8 | 12.9 | 12.9 | 11.2 |  |

See explanatory information and SOURCE at end of table.

**Table A-21. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in  
R&D-performing companies, by industry and size of company: 1987-97**

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| Industry and size of company  | SIC code                        | 1987      | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |  |
|---|---------------------------------|-----------|------|------|------|------|------|------|------|------|------|------|--|
|   |                                 | [Percent] |      |      |      |      |      |      |      |      |      |      |  |
| <b>Distribution by industry:</b>  |                                 |           |      |      |      |      |      |      |      |      |      |      |  |
| Professional and scientific instruments.....                                    | 38                              | 7.9       | 7.4  | 7.2  | 8.0  | 9.1  | 9.4  | 9.7  | 9.2  | 10.3 | 11.5 | 11.6 |  |
| Scientific and mechanical measuring instruments...                              | 381-82                          | (D)       | 7.9  | 7.4  | 8.6  | 10.0 | 10.6 | 11.5 | 11.0 | 12.4 | (D)  | 14.2 |  |
| Optical, surgical, photographic, and other instruments.....                     | 384-87                          | (D)       | 7.3  | 7.3  | 7.7  | 8.1  | 8.3  | 8.1  | 7.3  | 8.2  | (D)  | 9.1  |  |
| Other manufacturing industries <sup>2</sup> .....                               | 27,31,39                        | (D)       | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | 2.2  |  |
| Nonmanufacturing <sup>1</sup> .....   |                                 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.0  | 0.0  | 0.0  |  |
| Transportation and utilities.....   | 40-42,44-49                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 1.2  | 1.0  | 0.5  |  |
| Communications.....   | 48                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)  | (D)  |  |
| Telephone communications.....   | 481                             | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)  | (D)  |  |
| Other communications.....   | 482-484,489                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 3.0  | 1.3  | 0.7  |  |
| Electric, gas, and sanitary services.....                                       | 49                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.3  | 0.2  | (D)  |  |
| Other transportation and utilities.....   | 40-42,44-47                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)  | (D)  |  |
| Trade.....  | 50-59                           | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | 2.3  | (D)  |  |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)  | (D)  |  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 7.8  | 8.1  | 10.3 |  |
| Business services.....  | 73                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 10.1 | 10.2 | 11.2 |  |
| Computer and data processing services.....                                      | 737                             | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 11.8 | (D)  | 13.7 |  |
| Other business services.....  | 731-736,738                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 1.6  | (D)  | 1.2  |  |
| Health services.....  | 80                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 5.2  | (D)  | (D)  |  |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | 6.1  | (S)  |  |
| Other health services.....  | 802-805,808-809                 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)  | 4.6  |  |
| Engineering and management services.....  | 87                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 7.8  | 9.7  | 17.0 |  |
| Engineering, architectural, and surveying.....                                  | 871                             | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 5.7  | 6.2  | 6.8  |  |
| Research, development, and testing....  | 873                             | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | 14.0 | (D)  |  |

See explanatory information and SOURCE at end of table.

**Table A-21. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1987-97**

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| Industry and size of company                         | SIC code                     | 1987      | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |  |
|--|------------------------------|-----------|------|------|------|------|------|------|------|------|------|------|--|
|  |                              | [Percent] |      |      |      |      |      |      |      |      |      |      |  |
| <b>Distribution by industry:</b>                     |                              |           |      |      |      |      |      |      |      |      |      |      |  |
| Other engineering and management services.....       | 872,874                      | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | 1.8  | (D)  |  |
| Other services.....                                  | 701,72,75-79,81,<br>83,84,89 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.6  | (D)  | (D)  |  |
| Other nonmanufacturing industries <sup>2</sup> ..... | 07-12,14,15,<br>161-162,17   | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.8  | (D)  | 3.1  |  |
| <b>Distribution by size of company:</b>              |                              |           |      |      |      |      |      |      |      |      |      |      |  |
| [Number of employees]                                |                              |           |      |      |      |      |      |      |      |      |      |      |  |
| Total <sup>1</sup> .....                             |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.0  | 0.0  | 0.0  |  |
| Fewer than 500.....                                  |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 4.4  | 6.0  | 6.3  |  |
| 500 to 999.....                                      |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 3.2  | 3.1  | 3.0  |  |
| 1,000 to 4,999.....                                  |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.8  | 3.0  | 2.7  |  |
| 5,000 to 9,999.....                                  |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.0  | 2.7  | 2.5  |  |
| 10,000 to 24,999.....                                |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.3  | 2.5  | 2.6  |  |
| 25,000 or more.....                                  |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 4.3  | 4.0  | 3.9  |  |

<sup>1</sup> Beginning in 1995, this table included both manufacturing and nonmanufacturing companies. Only manufacturing companies were included in prior years.

<sup>2</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTE:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1987-97**

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| Industry and size of company                    | SIC code       | 1987      | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|----------------|-----------|------|------|------|------|------|------|------|------|------|------|
|   |                | [Percent] |      |      |      |      |      |      |      |      |      |      |
| All Industries <sup>1</sup> .....               |                | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.8  | 3.0  | 2.9  |
| Distribution by industry:                       |                |           |      |      |      |      |      |      |      |      |      |      |
| Manufacturing.....                              |                | 3.1       | 3.1  | 3.1  | 3.1  | 3.2  | 3.3  | 3.1  | 2.9  | 2.9  | 3.3  | 3.3  |
| Food, kindred, and tobacco products.....        | 20,21          | 0.6       | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.4  | 0.5  |
| Textiles and apparel.....                       | 22,23          | 0.4       | 0.4  | 0.5  | 0.6  | 0.6  | 0.6  | 0.6  | 0.6  | 0.9  | 0.8  | 0.9  |
| Lumber, wood products, and furniture.....       | 24,25          | 0.6       | 0.6  | 0.6  | 0.6  | 0.9  | 0.9  | 0.7  | 0.6  | 0.7  | 1.4  | 0.9  |
| Paper and allied products.....                  | 26             | 0.6       | 0.8  | 0.8  | 1.0  | 1.1  | 1.0  | 1.1  | 1.0  | 1.0  | 1.2  | 1.1  |
| Chemicals and allied products.....              | 28             | 5.2       | 5.2  | 5.4  | 5.3  | 5.3  | 5.4  | 6.0  | 5.1  | 4.7  | 5.3  | 5.3  |
| Industrial chemicals.....                       | 281-82,286     | 4.4       | 4.2  | 4.1  | 4.4  | 4.4  | 4.4  | 4.4  | 3.3  | 3.9  | 3.7  | 3.5  |
| Drugs and medicines.....                        | 283            | 8.7       | 8.8  | 8.9  | 8.8  | 8.9  | 9.6  | 12.5 | 10.2 | 10.4 | 10.1 | 10.5 |
| Other chemicals.....                            | 284-85,287-89  | 3.3       | 3.4  | 3.9  | 3.4  | 3.0  | 2.7  | 2.7  | 2.5  | 1.4  | 2.7  | 2.1  |
| Petroleum refining and extraction.....          | 13,29          | 1.0       | 1.0  | 0.9  | 0.9  | 1.0  | 0.9  | 0.9  | 0.8  | 0.7  | 0.7  | 0.6  |
| Rubber products.....                            | 30             | 1.6       | 1.7  | 1.9  | 2.1  | 2.3  | 2.3  | 2.1  | 2.3  | 1.6  | 1.8  | 1.4  |
| Stone, clay, and glass products.....            | 32             | 2.5       | 2.0  | 1.8  | 1.7  | 1.6  | 1.6  | 1.5  | 1.5  | 1.5  | 1.2  | 1.8  |
| Primary metals.....                             | 33             | 0.9       | 0.7  | 0.7  | 0.8  | 0.8  | 0.6  | 0.7  | 0.6  | 0.5  | 0.6  | 0.6  |
| Ferrous metals and products.....                | 331-32,3398-99 | 0.6       | 0.5  | 0.5  | 0.5  | 0.5  | 0.4  | 0.4  | 0.3  | 0.3  | 0.4  | 0.6  |
| Nonferrous metals and products.....             | 333-36         | 1.3       | 1.0  | 1.0  | 1.2  | 1.2  | 0.7  | 1.2  | 0.9  | 0.7  | 1.0  | 0.6  |
| Fabricated metal products.....                  | 34             | 1.2       | 1.1  | 1.2  | 1.1  | 1.2  | 1.1  | 1.1  | 1.0  | 1.1  | 1.4  | 1.5  |
| Machinery.....                                  | 35             | 7.1       | 6.8  | 7.3  | 7.2  | 7.5  | 7.3  | 4.5  | 3.8  | 3.6  | 5.1  | 5.6  |
| Office, computing, and accounting machines..... | 357            | 12.3      | 11.2 | 13.1 | 14.4 | 14.9 | 13.7 | 9.8  | 7.9  | 8.1  | 9.9  | 9.2  |
| Other machinery, except electrical.....         | 351-56,358-59  | 3.0       | 2.8  | 2.6  | 2.3  | 2.9  | 2.9  | 2.5  | 2.5  | 2.4  | 2.9  | 3.0  |
| Electrical equipment.....                       | 36             | 5.4       | 5.3  | 5.2  | 4.5  | 4.3  | 4.0  | 5.4  | 5.2  | 5.4  | 6.1  | 5.7  |
| Radio and TV receiving equipment.....           | 365            | 3.2       | 2.4  | 1.8  | 1.6  | 1.0  | 0.6  | 4.0  | 1.0  | 1.6  | 2.0  | 2.6  |
| Communication equipment.....                    | 366            | 5.5       | 6.1  | 6.8  | 6.1  | (S)  | 7.0  | 10.1 | 10.3 | 8.0  | 8.5  | 8.0  |
| Electronic components.....                      | 367            | 8.5       | 8.0  | 7.7  | 7.4  | 7.2  | 7.0  | 7.8  | 7.3  | 8.0  | 8.5  | 8.1  |
| Other electrical equipment.....                 | 361-64,369     | 2.6       | 2.3  | 2.3  | 2.2  | 2.2  | 2.1  | 2.3  | 2.1  | 2.5  | 2.6  | 2.7  |
| Transportation equipment.....                   | 37             | 3.4       | 3.5  | 3.5  | 3.4  | 4.0  | 4.2  | 3.9  | 3.7  | 3.6  | 4.1  | 3.8  |
| Motor vehicles and motor vehicles equipment.... | 371            | 3.4       | 3.4  | 3.7  | 3.7  | 4.1  | 4.0  | 3.7  | 3.4  | 3.6  | 4.2  | 3.8  |

See explanatory information and SOURCE at end of table.

**Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1987-97**

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| Industry and size of company  | SIC code                        | 1987      | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995    | 1996    | 1997 |
|---|---------------------------------|-----------|------|------|------|------|------|------|------|---------|---------|------|
|   |                                 | [Percent] |      |      |      |      |      |      |      |         |         |      |
| <b>Distribution by industry:</b>  |                                 |           |      |      |      |      |      |      |      |         |         |      |
| Other transportation equipment.....   | 373-75,379                      | 2.5       | 2.6  | 2.5  | 2.1  | 2.1  | 2.1  | 1.9  | 1.2  | 0.9     | 1.2     | 2.2  |
| Aircraft and missiles.....  | 372,376                         | 3.6       | 3.9  | 3.3  | 3.1  | 4.0  | 4.7  | 4.7  | 5.3  | 4.2     | 4.5     | 3.9  |
| Professional and scientific instruments.....                                    | 38                              | 7.5       | 7.1  | 6.8  | 7.1  | 7.1  | 7.2  | 7.2  | 6.5  | 7.3     | 7.7     | 7.7  |
| Scientific and mechanical measuring instruments.....                            | 381-82                          | 8.1       | 7.6  | 6.9  | 6.9  | 6.3  | 6.2  | 6.4  | 5.8  | 6.6     | 6.7     | 6.5  |
| Optical, surgical, photographic, and other instruments.....                     | 384-87                          | 7.2       | 7.1  | 7.1  | 7.5  | 8.0  | 8.2  | 7.9  | 7.2  | 8.0     | 8.6     | 8.9  |
| Other manufacturing industries <sup>2</sup> .....                               | 27,31,39                        | 1.1       | 1.0  | 0.9  | 0.9  | 0.8  | 1.3  | 1.3  | 1.1  | 1.2     | 2.5     | 2.0  |
| Nonmanufacturing <sup>1</sup> .....   |                                 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.4     | 2.2     | 2.2  |
| Transportation and utilities.....   | 40-42,44-49                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 1.1     | 1.0     | 0.4  |
| Communications.....   | 48                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.2     | 1.9     | 0.7  |
| Telephone communications.....   | 481                             | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.1     | 1.9     | 0.7  |
| Other communications.....   | 482-84,489                      | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 3.0     | 1.3     | 0.7  |
| Electric, gas, and sanitary services.....                                       | 49                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.2     | 0.2     | 0.1  |
| Other transportation and utilities.....   | 40-42,44-47                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.1     | 0.3     | 0.3  |
| Trade.....  | 50-59                           | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.4     | 2.3     | 2.4  |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.7     | 0.4     | 0.7  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 5.9     | 6.8     | 8.6  |
| Business services.....  | 73                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 9.5     | 9.9     | 10.8 |
| Computer and data processing services....                                       | 737                             | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 11.1    | 12.4    | 13.3 |
| Other business services.....  | 731-736,738                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.9     | 1.1     | 1.1  |
| Health services.....  | 80                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 5.2     | 5.9 (S) | 5.2  |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 5.3     | 6.1 (S) | (D)  |
| Other health services.....  | 802-805,808-809                 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.4 (S) | 3.4     | (D)  |

See explanatory information and SOURCE at end of table.

**Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1987-97**

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| Industry and size of company                         | SIC code                     | 1987      | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|--|------------------------------|-----------|------|------|------|------|------|------|------|------|------|------|
|  |                              | [Percent] |      |      |      |      |      |      |      |      |      |      |
| <b>Distribution by industry:</b>                     |                              |           |      |      |      |      |      |      |      |      |      |      |
| Engineering and management services.....             | 87                           | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 4.1  | 6.1  | 10.8 |
| Engineering, architectural, and surveying.....       | 871                          | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.0  | 2.5  | 2.6  |
| Research, development, and testing.....              | 873                          | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 7.2  | 9.7  | 38.5 |
| Other engineering and management services...         | 872,874                      | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 1.7  | 1.3  | 2.8  |
| Other services.....                                  | 701,72,75-79,81,<br>83,84,89 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.6  | 0.7  | 1.0  |
| Other nonmanufacturing industries <sup>2</sup> ..... | 07-12,14,15,<br>161-162,17   | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0.8  | 2.5  | 2.9  |
| <b>Distribution by size of company:</b>              |                              |           |      |      |      |      |      |      |      |      |      |      |
| [Number of employees]                                |                              |           |      |      |      |      |      |      |      |      |      |      |
| Total <sup>1</sup> .....                             |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.8  | 3.0  | 2.9  |
| Fewer than 500.....                                  |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 3.9  | 5.3  | 5.7  |
| 500 to 999.....                                      |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 3.0  | 3.0  | 2.8  |
| 1,000 to 4,999.....                                  |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.6  | 2.9  | 2.6  |
| 5,000 to 9,999.....                                  |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.0  | 2.6  | 2.4  |
| 10,000 to 24,999.....                                |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 2.0  | 2.4  | 2.5  |
| 25,000 or more.....                                  |                              | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 3.1  | 2.9  | 2.9  |

<sup>1</sup> Beginning in 1995, this table included both manufacturing and nonmanufacturing companies. Only manufacturing companies were included in prior years.

<sup>2</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTE:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-23. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies,  
by industry and ranked by size of R&D program: 1997**

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| Industry  | SIC code       | Total R&D funds as a percent of net sales |                     |                      | Total R&D funds       |                     |                      |
|---|----------------|---|---------------------|----------------------|-----------------------|---------------------|----------------------|
|   |                | First 4<br>companies                      | Next 4<br>companies | Next 12<br>companies | First 4<br>companies  | Next 4<br>companies | Next 12<br>companies |
|   |                | [Percent]                                 |                     |                      | [Dollars in millions] |                     |                      |
| All Industries .....                            |                | 7.5                                       | 12.2                | 8.7                  | 21,364                | 12,278              | 20,807               |
| Manufacturing.....                              |                | 7.5                                       | 12.2                | 8.1                  | 21,364                | 12,278              | 20,036               |
| Food, kindred, and tobacco products.....        | 20,21          | 1.2                                       | 0.5                 | 0.4                  | 679                   | 257                 | 303                  |
| Textiles and apparel.....                       | 22,23          | 2.1                                       | 1.2                 | 0.6                  | 235                   | 60                  | 68                   |
| Lumber, wood products, and furniture.....       | 24,25          | 3.0                                       | 0.7                 | 0.6                  | 145                   | 52                  | 59                   |
| Paper and allied products.....                  | 26             | 2.4                                       | 1.1                 | 0.5                  | 995 (S)               | 171                 | 199                  |
| Chemicals and allied products.....              | 28             | 10.5                                      | 5.9                 | 10.9                 | 4,380                 | 3,366               | 5,510                |
| Industrial chemicals.....                       | 281-82,286     | 6.3                                       | 6.2                 | 3.5                  | 2,490                 | 1,027               | 1,157                |
| Drugs and medicines.....                        | 283            | 10.5                                      | 9.2                 | 17.4                 | 4,380                 | 2,888               | 3,457                |
| Other chemicals.....                            | 284-85,287-89  | 3.5                                       | 2.2                 | 1.5                  | 1,076                 | 198                 | 344                  |
| Petroleum refining and extraction.....          | 13,29          | 1.3                                       | 0.6                 | 0.2                  | 1,036                 | 455                 | 115                  |
| Rubber products.....                            | 30             | 4.1                                       | 2.1                 | 2.5                  | 546                   | 130                 | 211                  |
| Stone, clay, and glass products.....            | 32             | 2.8                                       | 1.6                 | 1.2                  | 377                   | 99                  | 96                   |
| Primary metals.....                             | 33             | 3.4                                       | 0.3                 | 0.6                  | 439                   | 99                  | 141                  |
| Ferrous metals and products.....                | 331-32,3398-99 | 1.1                                       | 0.5                 | 0.6                  | 335                   | 49                  | 75                   |
| Nonferrous metals and products.....             | 333-36         | 1.2                                       | 0.6                 | 0.7                  | 203                   | 52                  | 59                   |
| Fabricated metal products.....                  | 34             | 3.9                                       | 1.6                 | 0.9                  | 676                   | 188                 | 191                  |
| Machinery.....                                  | 35             | 11.8                                      | 6.4                 | 7.4                  | 8,186                 | 1,959               | 3,093                |
| Office, computing, and accounting<br>machines.. | 357            | 11.8                                      | 8.7                 | 9.5                  | 8,186                 | 1,668               | 1,803                |
| Other machinery, except electrical.....         | 351-56,358-59  | 5.5                                       | 4.7                 | 3.3                  | 1,625                 | 646                 | 785                  |
| Electrical equipment.....                       | 36             | 7.3                                       | 12.4                | 8.7                  | 9,605                 | 3,732               | 3,553                |
| Radio and TV receiving equipment.....           | 365            | 3.0                                       | 4.5                 | 1.0                  | 131                   | 10                  | 13                   |
| Communication equipment.....                    | 366            | 14.1                                      | 8.5                 | 9.5                  | 5,161                 | 748                 | 776                  |
| Electronic components.....                      | 367            | 12.5                                      | 7.6                 | 9.6                  | 6,616                 | 1,163               | 1,583                |
| Other electrical equipment.....                 | 361-64,369     | 3.5                                       | 3.8                 | 2.3                  | 3,147                 | 464                 | 442                  |

See explanatory information and SOURCE at end of table.

**Table A-23. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies,  
by industry and ranked by size of R&D program: 1997**

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| Industry   | SIC code                        | Total R&D funds as a percent of net sales |                     |                      | Total R&D funds       |                     |                      |
|--|---------------------------------|---|---------------------|----------------------|-----------------------|---------------------|----------------------|
|  |                                 | First 4<br>companies                      | Next 4<br>companies | Next 12<br>companies | First 4<br>companies  | Next 4<br>companies | Next 12<br>companies |
|  |                                 | [Percent]                                 |                     |                      | [Dollars in millions] |                     |                      |
| Transportation equipment.....                                  | 37                              | 7.5                                       | 6.7                 | 4.6                  | 21,364                | 6,559               | 3,057                |
| Motor vehicles and motor vehicles<br>equipment.....            | 371                             | 5.2                                       | 0.9                 | 1.4                  | 14,233                | 297                 | 333                  |
| Other transportation equipment.....                            | 373-75,379                      | 4.6                                       | 2.9                 | 2.3                  | 570                   | 34                  | 6                    |
| Aircraft and missiles.....                                     | 372,376                         | 12.6                                      | 10.5                | 5.2                  | 12,354                | 3,232               | 683                  |
| Professional and scientific instruments.....                   | 38                              | 16.3                                      | 13.2                | 11.4                 | 7,011                 | 1,473               | 1,505                |
| Scientific and mechanical measuring<br>instruments.....        | 381-82                          | 20.6                                      | 11.6                | 11.1                 | 5,455                 | 556                 | 643                  |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87                          | 11.0                                      | 13.4                | 8.9                  | 3,029                 | 580                 | 815                  |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39                        | 3.1                                       | 2.7                 | 0.9                  | 296                   | 142                 | 156                  |
| Nonmanufacturing .....   |                                 | 0.2                                       | 0.0                 | 0.1                  | 5,010                 | 2,624               | 2,905                |
| Transportation and utilities.....                              | 40-42,44-49                     | 1.6                                       | 0.3                 | 0.4                  | 1,835                 | 231                 | 261                  |
| Communications.....  | 48                              | 1.5                                       | 0.3                 | 0.3                  | 1,796                 | 170                 | 69                   |
| Telephone communications.....                                  | 481                             | 1.5                                       | 0.3                 | 0.1                  | 1,796                 | 170                 | (D)                  |
| Other communications.....                                      | 482-484,489                     | 3.2                                       | 0.2                 | 0.7                  | 36                    | 9                   | 4                    |
| Electric, gas, and sanitary services.....                      | 49                              | 0.4                                       | 0.2                 | 0.2                  | 117                   | 40 (S)              | 71                   |
| Other transportation and utilities.....                        | 40-42,44-47                     | 0.6                                       | 0.1                 | 0.1                  | 186                   | 22                  | 14                   |
| Trade.....   | 50-59                           | 8.8                                       | 19.7                | 1.5                  | 2,337                 | 565                 | 883                  |
| Finance, insurance, and real estate.....                       | 60-65,67                        | 2.4                                       | 0.2                 | 0.2                  | 588                   | 203                 | 149                  |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 23.6                                      | 17.2                | 24.3                 | 4,243                 | 1,250               | 1,838                |
| Business services.....   | 73                              | 23.3                                      | 16.5                | 19.2                 | 2,994                 | 903                 | 1,360                |
| Computer and data processing<br>services.....                  | 737                             | 23.3                                      | 16.5                | 19.2                 | 2,994                 | 903                 | 1,360                |
| Other business services.....                                   | 731-736,738                     | 3.9                                       | 1.9                 | 0.7                  | 129                   | 36                  | 54                   |

See explanatory information and SOURCE at end of table.

**Table A-23. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies,  
by industry and ranked by size of R&D program: 1997**

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| Industry   | SIC code                     | Total R&D funds as a percent of net sales |                     |                      | Total R&D funds       |                     |                      |
|--|------------------------------|---|---------------------|----------------------|-----------------------|---------------------|----------------------|
|  |                              | First 4<br>companies                      | Next 4<br>companies | Next 12<br>companies | First 4<br>companies  | Next 4<br>companies | Next 12<br>companies |
|  |                              | [Percent]                                 |                     |                      | [Dollars in millions] |                     |                      |
| Health services.....   | 80                           | 11.6                                      | 1.0                 | 0.8                  | (D)                   | 17                  | 22                   |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                  | 9.3                                       | 7.9                 | 0.3                  | (D)                   | 14                  | 8                    |
| Other health services.....   | 802-805,808-809              | 4.7                                       | 3.3                 | 0.0                  | 36                    | 3                   | 0                    |
| Engineering and management services.....   | 87                           | 39.1                                      | 51.4                | 75.1                 | 1,954 (S)             | 419                 | 720                  |
| Engineering, architectural, and<br>surveying.....                                  | 871                          | 22.5                                      | 10.9                | 6.5                  | 396                   | 204                 | 291                  |
| Research, development, and testing.....  | 873                          | 47.4                                      | 88.4                | 58.7                 | 1,912 (S)             | 345                 | 600                  |
| Other engineering and management<br>services....                                   | 872, 874                     | 4.9                                       | 12.5                | 0.3                  | 107                   | 34                  | 23                   |
| Other services.....  | 701,72,75-79,81,<br>83,84,89 | 0.7                                       | 1.6                 | 0.2                  | 119                   | 21                  | 19                   |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17   | 2.3                                       | 0.9                 | 0.5                  | 212                   | 41                  | 53                   |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**NOTE:** Rankings were based on total (company, Federal, and other) R&D funds.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-24. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry  
and ranked by size of company-financed R&D program: 1997**

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| Industry   | SIC code       | Company and other R&D funds as a percent of net sales |                     |                      | Company and other R&D funds |                     |                      |
|--|----------------|---|---------------------|----------------------|-----------------------------|---------------------|----------------------|
|  |                | First 4<br>companies                                  | Next 4<br>companies | Next 12<br>companies | First 4<br>companies        | Next 4<br>companies | Next 12<br>companies |
|  |                | [Percent]   |                     |                      | [Dollars in millions]       |                     |                      |
| All Industries .....                                   |                | 6.7   | 8.4                 | 5.9                  | 17,685                      | 9,600               | 14,920               |
| Manufacturing.....                                     |                | 6.7   | 8.4                 | 5.7                  | 17,685                      | 9,600               | 14,223               |
| Food, kindred, and tobacco products.....               | 20,21          | 1.2   | 0.5                 | 0.4                  | 679                         | 257                 | 303                  |
| Textiles and apparel.....                              | 22,23          | 2.1   | 1.2                 | 0.6                  | 235                         | 60                  | 68                   |
| Lumber, wood products, and furniture.....              | 24,25          | 3.0   | 0.7                 | 0.6                  | 145                         | 52                  | 59                   |
| Paper and allied products.....                         | 26             | 2.3   | 1.1                 | 0.5                  | 950 (S)                     | 171                 | 199                  |
| Chemicals and allied products.....                     | 28             | 10.5  | 5.9                 | 11.9                 | 4,380                       | 3,364               | 5,307                |
| Industrial chemicals.....                              | 281 82,286     | 6.1   | 3.9                 | 3.4                  | 2,335                       | 710                 | 1,109                |
| Drugs and medicines.....                               | 283            | 10.5  | 9.2                 | 17.4                 | 4,380                       | 2,888               | 3,457                |
| Other chemicals.....                                   | 284 85,287 89  | 3.5   | 2.2                 | 1.4                  | 1,076                       | 198                 | 340                  |
| Petroleum refining and extraction.....                 | 13,29          | 1.3   | 0.6                 | 0.2                  | 1,036                       | 448                 | 114                  |
| Rubber products.....                                   | 30             | 4.1   | 2.1                 | 2.6                  | 546                         | 130                 | 204                  |
| Stone, clay, and glass products.....                   | 32             | 2.8   | 1.5                 | 1.1                  | 376                         | 98                  | 96                   |
| Primary metals.....                                    | 33             | 0.7   | 0.7                 | 0.6                  | 246                         | 94                  | 141                  |
| Ferrous metals and products.....                       | 331 32,3398 99 | 0.5   | 0.5                 | 0.6                  | 142                         | 49                  | 74                   |
| Nonferrous metals and products.....                    | 333 36         | 1.2   | 0.6                 | 0.7                  | 199                         | 52                  | 59                   |
| Fabricated metal products.....                         | 34             | 3.9   | 1.4                 | 0.8                  | 676                         | 175                 | 168                  |
| Machinery.....   | 35             | 11.8  | 6.3                 | 7.4                  | 8,149                       | 1,927               | 3,089                |
| Office, computing, and accounting<br>machines... ..... | 357            | 11.8  | 8.6                 | 9.4                  | 8,149                       | 1,662               | 1,793                |
| Other machinery, except electrical.....                | 351 56,358 59  | 5.4   | 4.6                 | 3.5                  | 1,593                       | 639                 | 783                  |
| Electrical equipment.....                              | 36             | 11.6  | 3.8                 | 9.8                  | 8,716                       | 3,471               | 3,204                |
| Radio and TV receiving equipment.....                  | 365            | 3.0   | 4.5                 | 0.8                  | 130                         | 10                  | 11                   |
| Communication equipment.....                           | 366            | 13.5  | 6.5                 | 5.7                  | 4,710                       | 691                 | 675                  |
| Electronic components.....                             | 367            | 11.3  | 7.5                 | 9.6                  | 5,999                       | 1,149               | 1,583                |
| Other electrical equipment.....                        | 361 64,369     | 3.1   | 3.8                 | 2.3                  | 2,760                       | 462                 | 441                  |

See explanatory information and SOURCE at end of table.

**Table A-24. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry  
and ranked by size of company-financed R&D program: 1997**

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| Industry   | SIC code                        | Company and other R&D funds as a percent of net sales |                     |                      | Company and other R&D funds |                     |                      |
|--|---------------------------------|---|---------------------|----------------------|-----------------------------|---------------------|----------------------|
|  |                                 | First 4<br>companies                                  | Next 4<br>companies | Next 12<br>companies | First 4<br>companies        | Next 4<br>companies | Next 12<br>companies |
|  |                                 | [Percent]   |                     |                      | [Dollars in millions]       |                     |                      |
| Transportation equipment.....                                  | 37                              | 4.7   | 4.1                 | 19.0                 | 14,982                      | 2,635               | 1,252                |
| Motor vehicles and motor vehicles<br>equipment.....            | 371                             | 4.7   | 0.9                 | 1.4                  | 12,925                      | 297                 | 330                  |
| Other transportation equipment.....                            | 373 75,379                      | 2.1   | 2.9                 | 2.3                  | 262                         | 34                  | 6                    |
| Aircraft and missiles.....                                     | 372,376                         | 4.5   | 2.6                 | 2.7                  | 4,602                       | 721                 | 336                  |
| Professional and scientific instruments.....                   | 38                              | 7.9   | 7.3                 | 11.7                 | 3,312                       | 881                 | 1,492                |
| Scientific and mechanical measuring<br>instruments..           | 381 82                          | 4.6   | 11.2                | 10.1                 | 1,216                       | 548                 | 606                  |
| Optical, surgical, photographic, and<br>other instruments..... | 384 87                          | 10.8  | 13.3                | 8.8                  | 2,977                       | 577                 | 806                  |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39                        | 3.1   | 2.7                 | 0.9                  | 296                         | 142                 | 156                  |
| Nonmanufacturing .....   |                                 | 0.1   | 0.1                 | 0.1                  | 4,437                       | 2,163               | 2,510                |
| Transportation and utilities.....                              | 40 42,44 49                     | 1.5   | 0.3                 | 0.3                  | 1,673                       | 231                 | 236                  |
| Communications.....  | 48                              | 1.3   | 0.3                 | 0.3                  | 1,635                       | 170                 | 69                   |
| Telephone communications.....                                  | 481                             | 1.3   | 0.3                 | 0.1                  | 1,635                       | 170                 | (D)                  |
| Other communications.....                                      | 482 484,489                     | 3.2   | 0.2                 | 0.7                  | 36                          | 9                   | 4                    |
| Electric, gas, and sanitary services.....                      | 49                              | 0.4   | 0.1                 | 0.2                  | 97                          | 39                  | 67                   |
| Other transportation and utilities.....                        | 40 42,44 47                     | 0.6   | 0.1                 | 0.1                  | 180                         | 17                  | 10                   |
| Trade.....   | 50 59                           | 8.7   | 19.7                | 1.5                  | 2,318                       | 565                 | 883                  |
| Finance, insurance, and real estate.....                       | 60 65,67                        | 2.4   | 0.2                 | 0.2                  | 588                         | 203                 | 149                  |
| Services.....  | 701,72,73,75 81,<br>83,84,87,89 | 20.6  | 15.6                | 25.3                 | 3,239                       | 1,040               | 1,675                |
| Business services.....   | 73                              | 23.2  | 16.5                | 19.2                 | 2,980                       | 903                 | 1,360                |
| Computer and data processing<br>services... .....              | 737                             | 23.2  | 16.5                | 19.2                 | 2,980                       | 903                 | 1,360                |
| Other business services.....                                   | 731 736,738                     | 3.4   | 2.2                 | 0.6                  | 125                         | 35                  | 50                   |

See explanatory information and SOURCE at end of table.

**Table A-24. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry  
and ranked by size of company-financed R&D program: 1997**

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| Industry   | SIC code                     | Company and other R&D funds as a percent of net sales |                     |                      | Company and other R&D funds |                     |                      |
|--|------------------------------|---|---------------------|----------------------|-----------------------------|---------------------|----------------------|
|  |                              | First 4<br>companies                                  | Next 4<br>companies | Next 12<br>companies | First 4<br>companies        | Next 4<br>companies | Next 12<br>companies |
|  |                              | [Percent]   |                     |                      | [Dollars in millions]       |                     |                      |
| Health services.....   | 80                           | 11.6  | 10.0                | 6.0                  | (D)                         | 17                  | 21                   |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                  | 9.3   | 7.9                 | 0.3                  | (D)                         | 14                  | 8                    |
| Other health services.....   | 802 805,808 809              | 4.7   | 2.1                 | 0.0                  | 36                          | 2                   | 0                    |
| Engineering and management services.....   | 87                           | 55.7  | 8.7                 | 62.7                 | 609                         | 291                 | 589                  |
| Engineering, architectural, and<br>surveying.....                                  | 871                          | 5.8   | 27.8                | 1.7                  | 114                         | 60                  | 103                  |
| Research, development, and testing.....  | 873                          | 55.7  | 8.7                 | 62.7                 | 609                         | 291                 | 589                  |
| Other engineering and management<br>services .....                                 | 872,874                      | 4.2   | 12.5                | 0.3                  | 92                          | 34                  | 22                   |
| Other services.....  | 701,72,75 79,81,<br>83,84,89 | 0.6   | 0.6                 | 0.3                  | 109                         | 18                  | 19                   |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07 12,14,15,<br>161 162,17   | 2.3   | 0.9                 | 0.5                  | 212                         | 39                  | 51                   |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**NOTE:** Rankings were based on company and other R&D funds.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-25. Federal industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of federally-financed R&D program: 1997**

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| Industry   | SIC code       | Federal R&D funds as a percent of net sales |                     |                      | Federal R&D funds     |                     |                      |
|--|----------------|---|---------------------|----------------------|-----------------------|---------------------|----------------------|
|  |                | First 4<br>companies                        | Next 4<br>companies | Next 12<br>companies | First 4<br>companies  | Next 4<br>companies | Next 12<br>companies |
|  |                | [Percent]                                   |                     |                      | [Dollars in millions] |                     |                      |
| All Industries .....                               |                | 10.0  | 3.7                 | 3.0                  | 9,535                 | 5,514               | 4,358                |
| Manufacturing.....                                 |                | 10.0  | 3.0                 | 2.9                  | (D)                   | (D)                 | 3,854                |
| Food, kindred, and tobacco product .....           | 20,21          | 0.0   | 0.0                 | 0.0                  | 0                     | 0                   | 0                    |
| Textiles and apparel.....                          | 22,23          | 0.0   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Lumber, wood products, and furniture.....          | 24,25          | 0.0   | 0.0                 | 0.0                  | 0                     | 0                   | 0                    |
| Paper and allied products.....                     | 26             | 0.2   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Chemicals and allied products.....                 | 28             | 3.9   | 0.0                 | 0.0                  | 536 (S)               | 10                  | 5 (S)                |
| Industrial chemicals.....                          | 281-82,286     | 3.5   | 0.0                 | 0.0                  | (D)                   | 9 (S)               | 1 (S)                |
| Drugs and medicines.....                           | 283            | 0.5   | 0.0                 | 0.0                  | 3 (S)                 | 0                   | 0                    |
| Other chemicals.....                               | 284-85,287-89  | 2.3   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Petroleum refining and extraction.....             | 13,29          | 0.0   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Rubber products.....                               | 30             | 0.5   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Stone, clay, and glass products.....               | 32             | 0.1   | 0.0                 | 0.0                  | 2                     | 0                   | 0                    |
| Primary metals.....                                | 33             | 1.4   | 0.0                 | 0.0                  | 199                   | 2                   | 0                    |
| Ferrous metals and products.....                   | 331-32,3398-99 | 0.7   | 0.0                 | 0.0                  | 195                   | (D)                 | 0                    |
| Nonferrous metals and products.....                | 333-36         | 0.1   | 0.0                 | 0.0                  | 6                     | (D)                 | 0                    |
| Fabricated metal products.....                     | 34             | 1.4   | 0.0                 | 0.0                  | 46                    | (D)                 | 0                    |
| Machinery.....                                     | 35             | 0.2   | 0.2                 | 0.1                  | 81                    | 17                  | 6                    |
| Office, computing, and accounting<br>machines..... | 357            | 0.1   | 0.0                 | 0.0                  | 53                    | 0                   | 0                    |
| Other machinery, except electrical.....            | 351-56,358-59  | 0.2   | 0.4                 | 0.0                  | 42                    | 8 (S)               | 2                    |
| Electrical equipment.....                          | 36             | 1.7   | 1.7                 | 0.4                  | 1,534                 | 151                 | 71                   |
| Radio and TV receiving equipment.....              | 365            | 0.7   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Communication equipment.....                       | 366            | 14.8  | 0.6                 | 0.0                  | 660                   | 15 (S)              | (D)                  |
| Electronic components.....                         | 367            | 2.7   | 0.2                 | 0.0                  | (D)                   | 15                  | 4                    |
| Other electrical equipment.....                    | 361-64,369     | 0.5   | 0.1                 | 0.0                  | 411                   | 6                   | 2                    |

See explanatory information and SOURCE at end of table.

**Table A-25. Federal industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of federally-financed R&D program: 1997**

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| Industry  | SIC code                        | Federal R&D funds as a percent of net sales |                     |                      | Federal R&D funds     |                     |                      |
|---|---------------------------------|---|---------------------|----------------------|-----------------------|---------------------|----------------------|
|   |                                 | First 4<br>companies                        | Next 4<br>companies | Next 12<br>companies | First 4<br>companies  | Next 4<br>companies | Next 12<br>companies |
|   |                                 | [Percent]                                   |                     |                      | [Dollars in millions] |                     |                      |
| Transportation equipment.....                               | 37                              | 9.2   | 1.7                 | 0.9                  | 8,606                 | 2,802               | 840                  |
| Motor vehicles and motor vehicles equipment.....            | 371                             | 0.6   | 0.0                 | 0.0                  | (D)                   | (D)                 | 0                    |
| Other transportation equipment.....                         | 373-75,379                      | 3.6   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Aircraft and missiles.....                                  | 372,376                         | 9.2   | 4.9                 | 2.5                  | 8,606                 | 1,755               | 257                  |
| Professional and scientific instruments.....                | 38                              | 16.0  | 1.2                 | 1.3                  | 4,243                 | 149                 | 74                   |
| Scientific and mechanical measuring instruments.....        | 381-82                          | 16.0  | 3.9                 | 1.3                  | 4,243                 | 117                 | 42                   |
| Optical, surgical, photographic, and other instruments..... | 384-87                          | 0.6   | 0.3                 | 0.0                  | 67                    | 8                   | 1                    |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                        | 0.1   | 0.0                 | 0.0                  | 7                     | 0                   | 0                    |
| Nonmanufacturing .....                                      |                                 | 0.1   | 0.7                 | 0.1                  | 1,759 (S)             | 236                 | 392                  |
| Transportation and utilities.....                           | 40-42,44-49                     | 0.2   | 0.1                 | 0.0                  | 195                   | 6 (S)               | (D)                  |
| Communications.....   | 48                              | 0.2   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Telephone communications.....                               | 481                             | 0.2   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Other communications.....                                   | 482-484,489                     | 0.0   | 0.0                 | 0.0                  | 0                     | 0                   | 0                    |
| Electric, gas, and sanitary services.....                   | 49                              | 0.1   | 0.0                 | 0.0                  | (D)                   | (D)                 | 0                    |
| Other transportation and utilities.....                     | 40-42,44-47                     | 0.1   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Trade.....  | 50-59                           | 0.1   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Finance, insurance, and real estate.....                    | 60-65,67                        | 0.2   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 35.1  | 88.2                | 7.7                  | 1,674 (S)             | 222                 | 362                  |
| Business services.....                                      | 73                              | 34.4  | 4.7                 | 13.1                 | 88                    | 51                  | 63                   |
| Computer and data processing services... .....              | 737                             | 34.4  | 4.7                 | 15.6                 | 88                    | 51                  | 60                   |
| Other business services.....                                | 731-736,738                     | 5.4   | 0.0                 | 0.0                  | 11                    | 0                   | 0                    |

See explanatory information and SOURCE at end of table.

**Table A-25. Federal industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of federally-financed R&D program: 1997**

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| Industry  | SIC code                     | Federal R&D funds as a percent of net sales |                     |                      | Federal R&D funds     |                     |                      |
|---|------------------------------|---|---------------------|----------------------|-----------------------|---------------------|----------------------|
|   |                              | First 4<br>companies                        | Next 4<br>companies | Next 12<br>companies | First 4<br>companies  | Next 4<br>companies | Next 12<br>companies |
|   |                              | [Percent]                                   |                     |                      | [Dollars in millions] |                     |                      |
| Health services.....  | 80                           | 0.0   | 0.0                 | 0.0                  | 2                     | 0                   | 0                    |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                  | 0.0   | 0.0                 | 0.0                  | 0                     | 0                   | 0                    |
| Other health services.....  | 802-805,808-809              | 0.3   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Engineering and management services.....  | 87                           | 35.1  | 88.2                | 7.5                  | 1,674 (S)             | 222                 | 344                  |
| Engineering, architectural, and surveying .....                                 | 871                          | 21.6  | 83.9                | 4.6                  | 382                   | 172                 | 199                  |
| Research, development, and testing.....   | 873                          | 46.2  | 37.6                | 28.2                 | 1,493 (S)             | 108                 | 119                  |
| Other engineering and management services.....                                  | 872,874                      | 1.3   | 0.0                 | 0.0                  | (D)                   | 0                   | 0                    |
| Other services.....   | 701,72,75-79,81,<br>83,84,89 | 8.2   | 0.0                 | 0.0                  | 14                    | 0                   | 0                    |
| Other nonmanufacturing industries <sup>1</sup> .....                            | 07-12,14,15,<br>161-162,17   | 0.1   | 0.0                 | 0.0                  | 3                     | 0                   | 0                    |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**NOTE:** Rankings were based on Federal R&D funds.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-26. Total (company, Federal, and other) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953-97**

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| Year                    | Total                 |                          | Basic research     |                          | Applied research   |                          | Development        |                          |
|-------------------------|-----------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|
|                         | Current<br>dollars    | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars |
|                         | [Dollars in millions] |                          |                    |                          |                    |                          |                    |                          |
| 1953 <sup>1</sup> ..... | 3,630                 | 17,988                   | 151                | 748                      | 726                | 3,598                    | 2,753              | 13,642                   |
| 1954 <sup>1</sup> ..... | 4,070                 | 19,941                   | 166                | 813                      | 814                | 3,988                    | 3,090              | 15,140                   |
| 1955 <sup>1</sup> ..... | 4,640                 | 22,372                   | 189                | 911                      | 928                | 4,474                    | 3,523              | 16,986                   |
| 1956.....               | 6,605                 | 30,764                   | 253                | 1,178                    | 1,268              | 5,906                    | 5,084              | 23,680                   |
| 1957.....               | 7,731                 | 34,856                   | 271                | 1,222                    | 1,670              | 7,529                    | 5,790              | 26,105                   |
| 1958.....               | 8,389                 | 36,940                   | 295                | 1,299                    | 1,911              | 8,415                    | 6,183              | 27,226                   |
| 1959.....               | 9,618                 | 41,908                   | 320                | 1,394                    | 1,991              | 8,675                    | 7,307              | 31,839                   |
| 1960.....               | 10,509                | 45,161                   | 376                | 1,616                    | 2,029              | 8,719                    | 8,104              | 34,826                   |
| 1961.....               | 10,908                | 46,338                   | 395                | 1,678                    | 1,977              | 8,398                    | 8,536              | 36,262                   |
| 1962.....               | 11,464                | 48,087                   | 488                | 2,047                    | 2,449              | 10,273                   | 8,527              | 35,768                   |
| 1963.....               | 12,630                | 52,363                   | 522                | 2,164                    | 2,457              | 10,187                   | 9,651              | 40,012                   |
| 1964.....               | 13,512                | 55,196                   | 549                | 2,243                    | 2,600              | 10,621                   | 10,363             | 42,333                   |
| 1965.....               | 14,185                | 56,831                   | 592                | 2,372                    | 2,658              | 10,649                   | 10,935             | 43,810                   |
| 1966.....               | 15,548                | 60,569                   | 624                | 2,431                    | 2,843              | 11,075                   | 12,081             | 47,063                   |
| 1967.....               | 16,385                | 61,854                   | 629                | 2,374                    | 2,915              | 11,004                   | 12,841             | 48,475                   |
| 1968.....               | 17,429                | 63,057                   | 642                | 2,323                    | 3,124              | 11,302                   | 13,663             | 49,432                   |
| 1969.....               | 18,308                | 63,262                   | 618                | 2,135                    | 3,287              | 11,358                   | 14,403             | 49,768                   |
| 1970.....               | 18,067                | 59,275                   | 602                | 1,975                    | 3,427              | 11,243                   | 14,038             | 46,056                   |
| 1971.....               | 18,320                | 57,143                   | 590                | 1,840                    | 3,415              | 10,652                   | 14,315             | 44,651                   |
| 1972.....               | 19,552                | 58,504                   | 593                | 1,774                    | 3,514              | 10,515                   | 15,445             | 46,215                   |
| 1973.....               | 21,249                | 60,195                   | 631                | 1,788                    | 3,825              | 10,836                   | 16,793             | 47,572                   |
| 1974.....               | 22,887                | 59,493                   | 699                | 1,817                    | 4,288              | 11,146                   | 17,900             | 46,530                   |
| 1975.....               | 24,187                | 57,465                   | 730                | 1,734                    | 4,570              | 10,858                   | 18,887             | 44,873                   |
| 1976.....               | 26,997                | 60,599                   | 819                | 1,838                    | 5,112              | 11,475                   | 21,066             | 47,286                   |
| 1977.....               | 29,825                | 62,882                   | 911                | 1,921                    | 5,636              | 11,883                   | 23,278             | 49,079                   |
| 1978 <sup>1</sup> ..... | 33,304                | 65,443                   | 1,035              | 2,034                    | 6,300              | 12,380                   | 25,969             | 51,030                   |
| 1979.....               | 38,226                | 69,212                   | 1,158              | 2,097                    | 7,225              | 13,082                   | 29,843             | 54,034                   |
| 1980 <sup>1</sup> ..... | 44,505                | 73,769                   | 1,325              | 2,196                    | 8,450              | 14,006                   | 34,730             | 57,567                   |
| 1981.....               | 51,810                | 78,488                   | 1,614              | 2,445                    | 10,699             | 16,208                   | 39,497             | 59,835                   |
| 1982 <sup>1</sup> ..... | 58,650                | 83,583                   | 1,904              | 2,713                    | 12,323             | 17,562                   | 44,423             | 63,308                   |
| 1983.....               | 65,268                | 89,213                   | 2,223              | 3,039                    | 13,927             | 19,036                   | 49,118             | 67,138                   |
| 1984.....               | 74,800                | 98,525                   | 2,608              | 3,435                    | 15,765             | 20,765                   | 56,427             | 74,324                   |
| 1985.....               | 84,239                | 107,270                  | 2,862              | 3,644                    | 18,255             | 23,246                   | 63,122             | 80,379                   |
| 1986.....               | 87,823                | 108,989                  | 4,047              | 5,022                    | 19,759             | 24,521                   | 64,017             | 79,445                   |
| 1987.....               | 92,155                | 110,950                  | 4,324              | 5,206                    | 19,813             | 23,854                   | 68,018             | 81,890                   |
| 1988.....               | 97,015                | 112,690                  | 4,500              | 5,227                    | 20,748             | 24,100                   | 71,767             | 83,363                   |
| 1989.....               | 102,055               | 113,748                  | 5,216              | 5,814                    | 22,691             | 25,291                   | 74,148             | 82,644                   |

See explanatory information and SOURCE at end of table

**Table A-26. Total (company, Federal, and other) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953-97**

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| Year      | Total                 |                          | Basic research     |                          | Applied research   |                          | Development        |                          |
|-----------|-----------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|
|           | Current<br>dollars    | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars |
|           | [Dollars in millions] |                          |                    |                          |                    |                          |                    |                          |
| 1990..... | 109,727               | 117,230                  | 5,128              | 5,479                    | 24,785             | 26,480                   | 79,814             | 85,271                   |
| 1991..... | 116,952               | 120,173                  | 7,837              | 8,053                    | 27,446             | 28,202                   | 81,669             | 83,918                   |
| 1992..... | 119,110               | 119,110                  | 7,002              | 7,002                    | 26,168             | 26,168                   | 85,940             | 85,940                   |
| 1993..... | 117,400               | 114,380                  | 6,919              | 6,741                    | 24,686             | 24,051                   | 85,796             | 83,589                   |
| 1994..... | 119,595               | 113,802                  | 7,017              | 6,677                    | 23,490             | 22,352                   | 89,088             | 84,773                   |
| 1995..... | 132,103               | 122,875                  | 6,099              | 5,673                    | 27,454             | 25,536                   | 98,552             | 91,668                   |
| 1996..... | 144,667               | 132,080                  | 8,207              | 7,493                    | 29,241             | 26,697                   | 107,218            | 97,889                   |
| 1997..... | 157,539               | 141,202                  | 10,419             | 9,339                    | 32,642             | 29,257                   | 114,478            | 102,606                  |

<sup>1</sup> Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, *National Patterns of R&D Resources: 1996*, Final report, NSF 96-333.

**NOTES:** The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

Gross domestic product (GDP) implicit price deflators were used to convert current dollars to constant (1992) dollars.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-27. Company and other (except Federal) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953-97**

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| Year                    | Total                 |                          | Basic research     |                          | Applied research   |                          | Development        |                          |
|-------------------------|-----------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|
|                         | Current<br>dollars    | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars |
|                         | [Dollars in millions] |                          |                    |                          |                    |                          |                    |                          |
| 1953 <sup>1</sup> ..... | 2,200                 | 10,902                   | 132                | 654                      | 438                | 2,170                    | 1,630              | 8,077                    |
| 1954 <sup>1</sup> ..... | 2,320                 | 11,367                   | 143                | 701                      | 492                | 2,411                    | 1,685              | 8,256                    |
| 1955 <sup>1</sup> ..... | 2,460                 | 11,861                   | 162                | 781                      | 560                | 2,700                    | 1,738              | 8,380                    |
| 1956.....               | 3,277                 | 15,263                   | 216                | 1,006                    | 794                | 3,698                    | 2,267              | 10,559                   |
| 1957.....               | 3,396                 | 15,311                   | 230                | 1,037                    | 992                | 4,472                    | 2,174              | 9,802                    |
| 1958.....               | 3,630                 | 15,984                   | 252                | 1,110                    | 1,137              | 5,007                    | 2,241              | 9,868                    |
| 1959.....               | 3,983                 | 17,355                   | 248                | 1,081                    | 1,178              | 5,133                    | 2,557              | 11,142                   |
| 1960.....               | 4,428                 | 19,029                   | 297                | 1,276                    | 1,196              | 5,140                    | 2,935              | 12,613                   |
| 1961.....               | 4,668                 | 19,830                   | 314                | 1,334                    | 1,165              | 4,949                    | 3,189              | 13,547                   |
| 1962.....               | 5,029                 | 21,095                   | 345                | 1,447                    | 1,438              | 6,032                    | 3,246              | 13,616                   |
| 1963.....               | 5,360                 | 22,222                   | 375                | 1,555                    | 1,450              | 6,012                    | 3,535              | 14,656                   |
| 1964.....               | 5,792                 | 23,660                   | 384                | 1,569                    | 1,560              | 6,373                    | 3,848              | 15,719                   |
| 1965.....               | 6,445                 | 25,821                   | 406                | 1,627                    | 1,620              | 6,490                    | 4,419              | 17,704                   |
| 1966.....               | 7,216                 | 28,111                   | 451                | 1,757                    | 1,804              | 7,028                    | 4,961              | 19,326                   |
| 1967.....               | 8,020                 | 30,276                   | 427                | 1,612                    | 1,849              | 6,980                    | 5,744              | 21,684                   |
| 1968.....               | 8,869                 | 32,088                   | 462                | 1,671                    | 2,081              | 7,529                    | 6,326              | 22,887                   |
| 1969.....               | 9,857                 | 34,060                   | 458                | 1,583                    | 2,272              | 7,851                    | 7,127              | 24,627                   |
| 1970.....               | 10,288                | 33,753                   | 444                | 1,457                    | 2,378              | 7,802                    | 7,466              | 24,495                   |
| 1971.....               | 10,654                | 33,231                   | 456                | 1,422                    | 2,441              | 7,614                    | 7,757              | 24,195                   |
| 1972.....               | 11,535                | 34,515                   | 463                | 1,385                    | 2,562              | 7,666                    | 8,510              | 25,464                   |
| 1973.....               | 13,104                | 37,122                   | 499                | 1,414                    | 2,832              | 8,023                    | 9,773              | 27,686                   |
| 1974.....               | 14,667                | 38,126                   | 536                | 1,393                    | 3,263              | 8,482                    | 10,868             | 28,251                   |
| 1975.....               | 15,582                | 37,021                   | 573                | 1,361                    | 3,440              | 8,173                    | 11,569             | 27,486                   |
| 1976.....               | 17,436                | 39,138                   | 634                | 1,423                    | 3,912              | 8,781                    | 12,890             | 28,934                   |
| 1977.....               | 19,340                | 40,776                   | 701                | 1,478                    | 4,311              | 9,089                    | 14,328             | 30,209                   |
| 1978 <sup>1</sup> ..... | 22,115                | 43,456                   | 785                | 1,543                    | 4,870              | 9,570                    | 16,460             | 32,344                   |
| 1979.....               | 25,708                | 46,547                   | 893                | 1,617                    | 5,670              | 10,266                   | 19,145             | 34,664                   |
| 1980 <sup>1</sup> ..... | 30,476                | 50,515                   | 1,035              | 1,716                    | 6,550              | 10,857                   | 22,891             | 37,943                   |
| 1981.....               | 35,428                | 53,671                   | 1,313              | 1,989                    | 8,359              | 12,663                   | 25,756             | 39,018                   |
| 1982 <sup>1</sup> ..... | 40,105                | 57,154                   | 1,523              | 2,170                    | 9,363              | 13,343                   | 29,219             | 41,640                   |
| 1983.....               | 44,588                | 60,946                   | 1,760              | 2,406                    | 10,286             | 14,060                   | 32,542             | 44,481                   |
| 1984.....               | 51,404                | 67,708                   | 2,132              | 2,808                    | 11,541             | 15,202                   | 37,731             | 49,698                   |
| 1985.....               | 57,043                | 72,638                   | 2,373              | 3,022                    | 12,908             | 16,437                   | 41,762             | 53,180                   |
| 1986.....               | 59,932                | 74,376                   | 3,496              | 4,339                    | 15,082             | 18,717                   | 41,354             | 51,320                   |
| 1987.....               | 61,403                | 73,926                   | 3,583              | 4,314                    | 15,153             | 18,243                   | 42,667             | 51,369                   |
| 1988.....               | 66,672                | 77,445                   | 3,507              | 4,074                    | 16,531             | 19,202                   | 46,634             | 54,169                   |
| 1989.....               | 73,501                | 81,923                   | 3,832              | 4,271                    | 17,993             | 20,055                   | 51,676             | 57,597                   |

See explanatory information and SOURCE at end of table.

**Table A-27. Company and other (except Federal) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953-97**

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| Year      | Total                 |                          | Basic research     |                          | Applied research   |                          | Development        |                          |
|-----------|-----------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|
|           | Current<br>dollars    | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars |
|           | [Dollars in millions] |                          |                    |                          |                    |                          |                    |                          |
| 1990..... | 81,602                | 87,182                   | 3,760              | 4,017                    | 18,432             | 19,692                   | 59,410             | 63,472                   |
| 1991..... | 90,580                | 93,074                   | 6,125              | 6,294                    | 21,425             | 22,015                   | 63,030             | 64,766                   |
| 1992..... | 94,388                | 94,388                   | 5,816              | 5,816                    | 21,184             | 21,184                   | 67,385             | 67,385                   |
| 1993..... | 94,591                | 92,158                   | 5,961              | 5,808                    | 19,956             | 19,443                   | 68,678             | 66,912                   |
| 1994..... | 97,131                | 92,426                   | 6,078              | 5,784                    | 19,372             | 18,434                   | 71,683             | 68,211                   |
| 1995..... | 108,652               | 101,062                  | 5,379              | 5,003                    | 23,755             | 22,096                   | 79,516             | 73,961                   |
| 1996..... | 121,015               | 110,486                  | 6,848              | 6,252                    | 25,370             | 23,163                   | 88,798             | 81,072                   |
| 1997..... | 133,611               | 119,755                  | 8,766              | 7,857                    | 29,782             | 26,694                   | 95,064             | 85,206                   |

<sup>1</sup> Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, *National Patterns of R&D Resources: 1996*, Final report, NSF 96-333.

**NOTES:** The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

Gross domestic product (GDP) implicit price deflators were used to convert current dollars to constant (1992) dollars.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-28. Federal funds for performance of industrial basic research, applied research, and development,  
in current and in constant dollars: 1953-97**

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| Year                    | Total                 |                          | Basic research     |                          | Applied research   |                          | Development        |                          |
|-------------------------|-----------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|
|                         | Current<br>dollars    | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars |
|                         | [Dollars in millions] |                          |                    |                          |                    |                          |                    |                          |
| 1953 <sup>1</sup> ..... | 1,430                 | 7,086                    | 19                 | 94                       | 288                | 1,427                    | 1,123              | 5,565                    |
| 1954 <sup>1</sup> ..... | 1,750                 | 8,574                    | 23                 | 113                      | 322                | 1,578                    | 1,405              | 6,884                    |
| 1955 <sup>1</sup> ..... | 2,180                 | 10,511                   | 27                 | 130                      | 368                | 1,774                    | 1,785              | 8,607                    |
| 1956.....               | 3,328                 | 15,501                   | 37                 | 172                      | 474                | 2,208                    | 2,817              | 13,121                   |
| 1957.....               | 4,335                 | 19,545                   | 41                 | 185                      | 678                | 3,057                    | 3,616              | 16,303                   |
| 1958.....               | 4,759                 | 20,956                   | 43                 | 189                      | 774                | 3,408                    | 3,942              | 17,358                   |
| 1959.....               | 5,635                 | 24,553                   | 72                 | 314                      | 813                | 3,542                    | 4,750              | 20,697                   |
| 1960.....               | 6,081                 | 26,132                   | 79                 | 339                      | 833                | 3,580                    | 5,169              | 22,213                   |
| 1961.....               | 6,240                 | 26,508                   | 81                 | 344                      | 812                | 3,449                    | 5,347              | 22,715                   |
| 1962.....               | 6,434                 | 26,988                   | 143                | 600                      | 1,011              | 4,241                    | 5,281              | 22,152                   |
| 1963.....               | 7,270                 | 30,141                   | 147                | 609                      | 1,007              | 4,175                    | 6,116              | 25,357                   |
| 1964.....               | 7,720                 | 31,536                   | 165                | 674                      | 1,040              | 4,248                    | 6,515              | 26,614                   |
| 1965.....               | 7,740                 | 31,010                   | 186                | 745                      | 1,038              | 4,159                    | 6,516              | 26,106                   |
| 1966.....               | 8,332                 | 32,458                   | 173                | 674                      | 1,039              | 4,048                    | 7,120              | 27,737                   |
| 1967.....               | 8,365                 | 31,578                   | 202                | 763                      | 1,066              | 4,024                    | 7,097              | 26,791                   |
| 1968.....               | 8,560                 | 30,970                   | 180                | 651                      | 1,043              | 3,774                    | 7,337              | 26,545                   |
| 1969.....               | \$8,451               | 29,202                   | 160                | 553                      | 1,015              | 3,507                    | 7,276              | 25,142                   |
| 1970.....               | 7,779                 | 25,522                   | 158                | 518                      | 1,049              | 3,442                    | 6,572              | 21,562                   |
| 1971.....               | 7,666                 | 23,911                   | 134                | 418                      | 974                | 3,038                    | 6,558              | 20,455                   |
| 1972.....               | 8,017                 | 23,989                   | 130                | 389                      | 952                | 2,849                    | 6,935              | 20,751                   |
| 1973.....               | 8,145                 | 23,074                   | 132                | 374                      | 993                | 2,813                    | 7,020              | 19,887                   |
| 1974.....               | 8,220                 | 21,367                   | 163                | 424                      | 1,025              | 2,664                    | 7,032              | 18,279                   |
| 1975.....               | 8,605                 | 20,444                   | 157                | 373                      | 1,130              | 2,685                    | 7,318              | 17,387                   |
| 1976.....               | 9,561                 | 21,461                   | 185                | 415                      | 1,200              | 2,694                    | 8,176              | 18,352                   |
| 1977.....               | 10,485                | 22,106                   | 210                | 443                      | 1,325              | 2,794                    | 8,950              | 18,870                   |
| 1978 <sup>1</sup> ..... | 11,189                | 21,987                   | 250                | 491                      | 1,430              | 2,810                    | 9,509              | 18,685                   |
| 1979.....               | 12,518                | 22,665                   | 265                | 480                      | 1,555              | 2,815                    | 10,698             | 19,370                   |
| 1980 <sup>1</sup> ..... | 14,029                | 23,254                   | 290                | 481                      | 1,900              | 3,149                    | 11,839             | 19,624                   |
| 1981.....               | 16,382                | 24,817                   | 301                | 456                      | 2,340              | 3,545                    | 13,741             | 20,817                   |
| 1982 <sup>1</sup> ..... | 18,545                | 26,429                   | 381                | 543                      | 2,960              | 4,218                    | 15,204             | 21,667                   |
| 1983.....               | 20,680                | 28,267                   | 463                | 633                      | 3,641              | 4,977                    | 16,576             | 22,657                   |
| 1984.....               | 23,396                | 30,817                   | 476                | 627                      | 4,224              | 5,564                    | 18,696             | 24,626                   |
| 1985.....               | 27,196                | 34,631                   | 489                | 623                      | 5,347              | 6,809                    | 21,360             | 27,200                   |
| 1986.....               | 27,891                | 34,613                   | 551                | 684                      | 4,678              | 5,805                    | 22,662             | 28,124                   |
| 1987.....               | 30,752                | 37,024                   | 740                | 891                      | 4,660              | 5,610                    | 25,352             | 30,523                   |
| 1988.....               | 30,343                | 35,246                   | 993                | 1,153                    | 4,217              | 4,898                    | 25,133             | 29,194                   |
| 1989.....               | 28,554                | 31,826                   | 1,384              | 1,543                    | 4,698              | 5,236                    | 22,472             | 25,047                   |

See explanatory information and SOURCE at end of table.

**Table A-28. Federal funds for performance of industrial basic research, applied research, and development,  
in current and in constant dollars: 1953-97**

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| Year      | Total                 |                          | Basic research     |                          | Applied research   |                          | Development        |                          |
|-----------|-----------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|
|           | Current<br>dollars    | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars | Current<br>dollars | Constant<br>1992 dollars |
|           | [Dollars in millions] |                          |                    |                          |                    |                          |                    |                          |
| 1990..... | 28,125                | 30,048                   | 1,368              | 1,462                    | 6,353              | 6,787                    | 20,404             | 21,799                   |
| 1991..... | 26,372                | 27,098                   | 1,712              | 1,759                    | 6,021              | 6,187                    | 18,639             | 19,152                   |
| 1992..... | 24,722                | 24,722                   | 1,186              | 1,186                    | 4,983              | 4,983                    | 18,555             | 18,555                   |
| 1993..... | 22,809                | 22,222                   | 958                | 933                      | 4,730              | 4,608                    | 17,118             | 16,678                   |
| 1994..... | 22,463                | 21,375                   | 939                | 894                      | 4,119              | 3,919                    | 17,405             | 16,562                   |
| 1995..... | 23,451                | 21,813                   | 720                | 670                      | 3,699              | 3,441                    | 19,031             | 17,702                   |
| 1996..... | 23,653                | 21,595                   | 1,358              | 1,240                    | 3,871              | 3,534                    | 18,423 (S)         | 16,820                   |
| 1997..... | 23,928                | 21,447                   | 1,654              | 1,482                    | 2,861              | 2,564                    | 19,412             | 17,399                   |

<sup>1</sup> Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, *National Patterns of R&D Resources: 1996*, Final report, NSF 96-333.

**NOTES:** The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

Gross domestic product (GDP) implicit price deflators were used to convert current dollars to constant (1992) dollars.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-29. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1995

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| Industry  | SIC code           | Total                 |         |         | Basic Research |         |         | Applied Research |         |         | Development |         |           |
|---|--------------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|-------------|---------|-----------|
|   |                    | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal | Company   |
|   |                    | [Dollars in millions] |         |         |                |         |         |                  |         |         |             |         |           |
| All Industries.....                             |                    | 132,103               | 23,451  | 108,652 | 6,099          | 720     | 5,379   | 27,454           | 3,699   | 23,755  | 98,552      | 19,031  | 79,516    |
| Manufacturing.....                              |                    | 100,067               | 18,831  | 81,236  | 3,849          | 290     | 3,559   | 20,416           | 2,140   | 18,276  | 75,804      | 16,399  | 59,401    |
| Food, kindred, and tobacco products .....       | 20,21              | 1,566                 | 0       | 1,566   | 153            | 0       | 153     | 510              | 0       | 510     | 903         | 0       | 903       |
| Textiles and apparel.....                       | 22,23              | (D)                   | (D)     | 381     | 29             | 0       | 29      | (D)              | (D)     | 49      | (D)         | (D)     | 303       |
| Lumber, wood products, and furniture.....       | 24,25              | (D)                   | (D)     | 229     | 21             | 0       | 21      | 38               | 0       | 38      | (D)         | (D)     | 169       |
| Paper and allied products.....                  | 26                 | (D)                   | (D)     | 1,404   | 245 (S)        | 0       | 245 (S) | (D)              | (D)     | 720 (S) | 439         | 0       | 439       |
| Chemicals and allied products.....              | 28                 | 17,547                | 210 (S) | 17,337  | (D)            | (D)     | 1,616   | (D)              | (D)     | 5,666   | 10,241      | 187 (S) | 10,055    |
| Industrial chemicals.....                       | 281-82,286         | (D)                   | (D)     | 5,139   | (D)            | (D)     | 514     | (D)              | (D)     | 1,437   | (D)         | (D)     | 3,188     |
| Drugs and medicines.....                        | 283                | 10,215                | 14      | 10,202  | 1,018          | 2       | 1,016   | 3,513            | 5       | 3,508   | 5,683       | 7       | 5,677     |
| Other chemicals.....                            | 284-85,<br>287-89  | (D)                   | (D)     | 1,996   | (D)            | (D)     | 86      | (D)              | (D)     | 720     | (D)         | (D)     | 1,190     |
| Petroleum refining and extraction.....          | 13,29              | 1,760                 | 6       | 1,754   | 115            | 0       | 115     | (D)              | (D)     | 719     | (D)         | (D)     | 920       |
| Rubber products.....                            | 30                 | (D)                   | (D)     | 1,210   | 67             | 0       | 67      | (D)              | (D)     | 229     | (D)         | (D)     | 915       |
| Stone, clay, and glass products.....            | 32                 | 448                   | 6       | 441     | 17             | 0       | 17      | (D)              | (D)     | 151     | (D)         | (D)     | 273       |
| Primary metals.....                             | 33                 | 593                   | 13      | 580     | 47             | 0       | 47      | (D)              | (D)     | 184     | (D)         | (D)     | 349       |
| Ferrous metals and products.....                | 331-32,<br>3398-99 | (D)                   | (D)     | 217     | 14             | 0       | 14      | 85               | 0       | 85      | (D)         | (D)     | 118       |
| Nonferrous metals and products.....             | 333-36             | (D)                   | (D)     | 363     | 33             | 0       | 33      | (D)              | (D)     | 100     | 235         | 5       | 231       |
| Fabricated metal products.....                  | 34                 | 1,023                 | 86      | 937     | (D)            | (D)     | 68      | 156              | 13      | 143     | (D)         | (D)     | 726       |
| Machinery.....                                  | 35                 | (D)                   | (D)     | 9,676   | (D)            | (D)     | 261     | 2,431            | 29      | 2,402   | 7,067       | 54      | 7,012     |
| Office, computing, and accounting machines..... | 357                | (D)                   | (D)     | 4,699   | (D)            | (D)     | 24      | (D)              | (D)     | 1,323   | (D)         | (D)     | 3,352 (S) |
| Other machinery, except electrical.....         | 351-56,<br>358-59  | 5,041                 | 64      | 4,976   | (D)            | (D)     | 238     | (D)              | (D)     | 1,079   | (D)         | (D)     | 3,660     |
| Electrical equipment.....                       | 36                 | 18,751                | 1,690   | 17,060  | (D)            | (D)     | 240     | (D)              | (D)     | 3,279   | 14,612      | 1,070   | 13,541    |
| Radio and TV receiving equipment.....           | 365                | (D)                   | (D)     | 114     | 5              | 0       | 5       | 16               | 0       | 16      | (D)         | (D)     | 94        |

See explanatory information and SOURCE at end of table.

Table A-29. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1995

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| Industry   | SIC code                            | Total                 |           |         | Basic Research |         |         | Applied Research |         |         | Development |           |         |
|--|-------------------------------------|-----------------------|-----------|---------|----------------|---------|---------|------------------|---------|---------|-------------|-----------|---------|
|  |                                     | Total                 | Federal   | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal   | Company |
|  |                                     | [Dollars in millions] |           |         |                |         |         |                  |         |         |             |           |         |
| Communication equipment.....                                   | 366                                 | (D)                   | (D)       | 3,845   | 56             | 0       | 56      | (D)              | (D)     | 664     | 3,644       | 519       | 3,125   |
| Electronic components.....                                     | 367                                 | (D)                   | (D)       | 9,628   | (D)            | (D)     | 88      | 2,435            | 430     | 2,005   | 7,705       | 169       | 7,535   |
| Other electrical equipment.....                                | 361-64,369                          | (D)                   | (D)       | 3,473   | (D)            | (D)     | 91      | (D)              | (D)     | 595     | (D)         | (D)       | 2,787   |
| Transportation equipment.....                                  | 37                                  | 32,441                | 13,130    | 19,311  | 348            | 250     | 98      | 2,791            | 705     | 2,086   | 29,302      | 12,175    | 17,127  |
| Motor vehicles and motor<br>vehicles equipment.....            | 371                                 | (D)                   | (D)       | 13,590  | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | (D)         | (D)       | 12,885  |
| Other transportation<br>equipment.....                         | 373-75,379                          | (D)                   | (D)       | 232     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | (D)         | (D)       | 179     |
| Aircraft and missiles.....                                     | 372,376                             | 16,951                | 11,462    | 5,489   | 252            | 250     | 2       | 1,987            | 564     | 1,423   | 14,712      | 10,648    | 4,064   |
| Professional and scientific<br>instruments.....                | 38                                  | 11,976                | 3,460 (S) | 8,516   | (D)            | (D)     | 499     | (D)              | (D)     | 2,015   | 8,812       | 2,810 (S) | 6,002   |
| Scientific and mechanical<br>measuring instruments.....        | 381-82                              | 7,146                 | 3,358 (S) | 3,787   | (D)            | (D)     | 257     | (D)              | (D)     | 1,406   | (D)         | (D)       | 2,125   |
| Optical, surgical, photographic,<br>and other instruments..... | 384-87                              | 4,831                 | 102       | 4,729   | (D)            | (D)     | 242     | 634              | 24      | 610     | (D)         | (D)       | 3,877   |
| Other manufacturing industries.....                            | 27,31,39                            | (D)                   | (D)       | 835     | (D)            | (D)     | 83      | 84               | 0       | 84      | 668         | 0         | 668     |
| Nonmanufacturing.....  |                                     | 32,036                | 4,620     | 27,415  | 2,250          | 430     | 1,820   | 7,038            | 1,558   | 5,480   | 22,748      | 2,632     | 20,115  |
| Transportation and utilities.....                              | 40-42,44-49                         | 5,435                 | 252       | 5,183   | (D)            | (D)     | 116     | (D)              | (D)     | 953     | 4,359       | 245       | 4,114   |
| Communications.....  | 48                                  | (D)                   | (D)       | 4,756   | (D)            | 0       | (D)     | (D)              | 0       | (D)     | (D)         | (D)       | 3,852   |
| Telephone<br>communications.....                               | 481                                 | (D)                   | (D)       | 4,697   | (D)            | 0       | (D)     | (D)              | 0       | (D)     | (D)         | (D)       | 3,809   |
| Other communications.....                                      | 482-484,489                         | 59                    | 0         | 59      | (D)            | 0       | (D)     | (D)              | 0       | (D)     | 43          | 0         | 43      |
| Electric, gas, and<br>sanitary services.....                   | 49                                  | 440                   | 93        | 347     | (D)            | (D)     | 48      | (D)              | (D)     | 105     | 280         | 86        | 194     |
| Other transportation<br>and utilities.....                     | 40-42,44-47                         | (D)                   | (D)       | 80      | (D)            | 0       | (D)     | (D)              | (D)     | (D)     | (D)         | (D)       | 68      |
| Trade.....   | 50-59                               | (D)                   | (D)       | 7,514   | (D)            | (D)     | 211     | (D)              | (D)     | 1,236   | (D)         | (D)       | 6,067   |
| Finance, insurance, and<br>real estate.....                    | 60-65,67                            | (D)                   | (D)       | 710     | (D)            | (D)     | 115     | (D)              | (D)     | 17      | (D)         | (D)       | 578     |
| Services.....  | 701,72,73,<br>75-81,83,84,<br>87,89 | 17,876                | 4,270     | 13,606  | 1,766          | 420     | 1,346   | 4,658            | 1,537   | 3,122   | 11,452      | 2,312     | 9,138   |

See explanatory information and SOURCE at end of table.

Table A-29. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1995

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| Industry  | SIC code                         | Total                 |         |         | Basic Research |         |         | Applied Research |         |         | Development |           |         |
|---|----------------------------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|-------------|-----------|---------|
|   |                                  | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal   | Company |
|   |                                  | [Dollars in millions] |         |         |                |         |         |                  |         |         |             |           |         |
| Business services.....  | 73                               | 9,293                 | 612     | 8,681   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | 6,972       | 276       | 6,695   |
| Computer and data processing services.....                                      | 737                              | 9,059                 | 514     | 8,545   | (D)            | (D)     | 569     | (D)              | (D)     | 1,376   | 6,796       | 196       | 6,600   |
| Other business services.....  | 731-736,738                      | 234                   | 98      | 136     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | 175         | 80        | 95      |
| Health services.....  | 80                               | 756                   | 4       | 753     | (D)            | (D)     | (D)     | 237              | 2       | 235     | (D)         | (D)       | (D)     |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                      | (D)                   | (D)     | 737     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | (D)         | (D)       | (D)     |
| Other health services.....  | 802-805,<br>808-809              | (D)                   | (D)     | 16 (S)  | 1              | (D)     | (D)     | (D)              | (D)     | (D)     | 7           | 0         | 7       |
| Engineering and management services.....  | 87                               | 7,662                 | 3,650   | 4,011   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | 3,887       | 2,034 (S) | 1,852   |
| Engineering, architectural, and surveying.....                                  | 871                              | 2,933                 | 1,883   | 1,050   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | 1,519       | 1,079     | 440     |
| Research, development, and testing.....   | 873                              | (D)                   | (D)     | 2,829   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | (D)         | (D)       | 1,287   |
| Other engineering and management services.....                                  | 872,874                          | (D)                   | (D)     | 132     | (D)            | (D)     | 7       | (D)              | (D)     | 0       | (D)         | (D)       | 125     |
| Other services.....   | 701,72,<br>75-79,81,<br>83,84,89 | 165                   | 4       | 160     | (D)            | (D)     | (D)     | 29               | 3       | 26      | (D)         | (D)       | (D)     |
| Other nonmanufacturing industries.....  | 07-12,14,15,<br>161-162,17       | 413                   | 11      | 402     | 32             | 0       | 32      | (D)              | (D)     | 153     | (D)         | (D)       | 217     |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; therefore, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-30. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1996

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| Industry  | SIC code           | Total                 |         |         | Basic Research |         |         | Applied Research |         |         | Development |            |         |
|---|--------------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|-------------|------------|---------|
|   |                    | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal    | Company |
|   |                    | [Dollars in millions] |         |         |                |         |         |                  |         |         |             |            |         |
| All Industries.....                             |                    | 144,667               | 23,653  | 121,015 | 8,207          | 1,358   | 6,848   | 29,241           | 3,871   | 25,370  | 107,218     | 18,423 (S) | 88,798  |
| Manufacturing.....                              |                    | 111,864               | 20,020  | 91,845  | (D)            | (D)     | 4,851   | (D)              | (D)     | 19,711  | 83,661      | 16,379     | 67,284  |
| Food, kindred, and tobacco products .....       | 20,21              | 1,564                 | 0       | 1,564   | 100            | 0       | 100     | 508              | 0       | 508     | 957         | 0          | 957     |
| Textiles and apparel.....                       | 22,23              | (D)                   | (D)     | 414     | 50             | 0       | 50      | (D)              | (D)     | 43      | (D)         | (D)        | 321     |
| Lumber, wood products, and furniture.....       | 24,25              | (D)                   | (D)     | 634     | 37             | 0       | 37      | (D)              | (D)     | 122     | 475         | 0          | 475     |
| Paper and allied products.....                  | 26                 | (D)                   | (D)     | 1,534   | 313 (S)        | 0       | 313 (S) | (D)              | (D)     | 706 (S) | (D)         | (D)        | 515     |
| Chemicals and allied products.....              | 28                 | (D)                   | (D)     | 17,520  | 1,628          | 8       | 1,620   | (D)              | (D)     | 5,667   | (D)         | (D)        | 10,233  |
| Industrial chemicals.....                       | 281-82,286         | (D)                   | (D)     | 5,246   | (D)            | (D)     | 697     | (D)              | (D)     | 1,468   | (D)         | (D)        | 3,081   |
| Drugs and medicines.....                        | 283                | 9,773                 | 3       | 9,769   | (D)            | (D)     | 856     | (D)              | (D)     | 3,157   | 5,758       | 2 (S)      | 5,755   |
| Other chemicals.....                            | 284-85,<br>287-89  | 2,505                 | 0       | 2,505   | 67             | 0       | 67      | 1,041            | 0       | 1,041   | 1,396       | 0          | 1,396   |
| Petroleum refining and extraction.....          | 13,29              | 1,654                 | 24      | 1,630   | (D)            | (D)     | (D)     | 592              | 2       | 590     | (D)         | (D)        | (D)     |
| Rubber products.....                            | 30                 | (D)                   | (D)     | 1,269   | (D)            | (D)     | 67      | (D)              | (D)     | 251     | (D)         | (D)        | 951     |
| Stone, clay, and glass products.....            | 32                 | 468                   | 5       | 463     | (D)            | (D)     | 21      | (D)              | (D)     | 162     | (D)         | (D)        | 280     |
| Primary metals.....                             | 33                 | (D)                   | (D)     | 637     | (D)            | (D)     | (D)     | (D)              | (D)     | 167     | 754 (S)     | (D)        | (D)     |
| Ferrous metals and products.....                | 331-32,<br>3398-99 | (D)                   | (D)     | 214     | 6              | (D)     | (D)     | (D)              | 0       | (D)     | (D)         | (D)        | (D)     |
| Nonferrous metals and products.....             | 333-36             | (D)                   | (D)     | 422     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     | (D)         | (D)        | 315     |
| Fabricated metal products.....                  | 34                 | (D)                   | (D)     | 1,322   | (D)            | (D)     | 140     | (D)              | (D)     | 247     | (D)         | (D)        | 934     |
| Machinery.....                                  | 35                 | 13,455                | 117     | 13,338  | (D)            | (D)     | 397     | (D)              | (D)     | 2,409   | 10,605      | 73         | 10,532  |
| Office, computing, and accounting machines..... | 357                | (D)                   | (D)     | 8,132   | (D)            | (D)     | 65      | (D)              | (D)     | 1,629   | (D)         | (D)        | 6,438   |
| Other machinery, except electrical.....         | 351-56,<br>358-59  | (D)                   | (D)     | 5,206   | (D)            | (D)     | 332     | (D)              | (D)     | 780     | (D)         | (D)        | 4,094   |
| Electrical equipment.....                       | 36                 | 22,498                | 2,143   | 20,356  | (D)            | (D)     | 531     | (D)              | (D)     | 4,926   | 15,662      | 764        | 14,898  |
| Radio and TV receiving equipment.....           | 365                | (D)                   | (D)     | 140     | 22             | (D)     | (D)     | (D)              | 0       | (D)     | (D)         | (D)        | 107     |
| Communication equipment.....                    | 366                | (D)                   | (D)     | 4,359   | (D)            | (D)     | 18      | (D)              | (D)     | 751     | 3,999       | 410        | 3,590   |

See explanatory information and SOURCE at end of table.

Table A-30. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1996

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| Industry   | SIC code                            | Total                 |         |         | Basic Research |         |         | Applied Research |           |         | Development |            |         |
|--|-------------------------------------|-----------------------|---------|---------|----------------|---------|---------|------------------|-----------|---------|-------------|------------|---------|
|  |                                     | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal   | Company | Total       | Federal    | Company |
|  |                                     | [Dollars in millions] |         |         |                |         |         |                  |           |         |             |            |         |
| Electronic components.....                                     | 367                                 | (D)                   | (D)     | 12,497  | (D)            | (D)     | (D)     | 4,799            | (D)       | (D)     | 8,767       | 116        | 8,651   |
| Other electrical equipment.....                                | 361-64,369                          | (D)                   | (D)     | 3,360   | (D)            | (D)     | 228     | (D)              | (D)       | 582     | (D)         | (D)        | 2,550   |
| Transportation equipment.....                                  | 37                                  | 32,737                | 12,202  | 20,535  | (D)            | (D)     | 277     | (D)              | (D)       | 2,361   | 28,648      | 10,752 (S) | 17,898  |
| Motor vehicles and motor<br>vehicles equipment.....            | 371                                 | (D)                   | (D)     | 14,528  | 104            | (D)     | (D)     | (D)              | (D)       | (D)     | (D)         | (D)        | 13,753  |
| Other transportation<br>equipment.....                         | 373-75,379                          | (D)                   | (D)     | 298     | (D)            | 0       | (D)     | 167              | (D)       | (D)     | (D)         | (D)        | 149     |
| Aircraft and missiles.....                                     | 372,376                             | 16,224                | 10,515  | 5,710   | (D)            | (D)     | 108     | (D)              | (D)       | (D)     | 13,259      | 9,264 (S)  | 3,995   |
| Professional and scientific<br>instruments.....                | 38                                  | 12,149                | 3,942   | 8,207   | (D)            | (D)     | 943     | 1,099            | 67        | 1,032   | (D)         | (D)        | 6,232   |
| Scientific and mechanical<br>measuring instruments.....        | 381-82                              | (D)                   | (D)     | 3,283   | (D)            | (D)     | 455     | 482              | 31        | 450     | (D)         | (D)        | 2,378   |
| Optical, surgical, photographic,<br>and other instruments..... | 384-87                              | (D)                   | (D)     | 4,924   | (D)            | (D)     | 488     | 617              | 35        | 582     | (D)         | (D)        | 3,854   |
| Other manufacturing<br>industries <sup>1</sup> .....           | 27,31,39                            | (D)                   | (D)     | 2,423   | (D)            | (D)     | 247     | 973              | 455       | 518     | 1,738       | 80         | 1,658   |
| Nonmanufacturing .....   |                                     | 32,803                | 3,633   | 29,170  | (D)            | (D)     | 1,997   | (D)              | (D)       | 5,659   | 23,557      | 2,044 (S)  | 21,514  |
| Transportation and utilities.....                              | 40-42,44-49                         | 4,678                 | 186     | 4,492   | (D)            | (D)     | (D)     | (D)              | (D)       | (D)     | 3,650       | 180        | 3,469   |
| Communications.....  | 48                                  | (D)                   | (D)     | 3,970   | (D)            | 0       | (D)     | (D)              | (D)       | (D)     | (D)         | (D)        | 3,040   |
| Telephone<br>communications.....                               | 481                                 | (D)                   | (D)     | 3,897   | (D)            | 0       | (D)     | (D)              | (D)       | (D)     | (D)         | (D)        | 2,982   |
| Other communications.....                                      | 482-484,489                         | 73                    | 0       | 73      | (D)            | 0       | (D)     | (D)              | (D)       | (D)     | (D)         | (D)        | 57      |
| Electric, gas, and<br>sanitary services.....                   | 49                                  | 352                   | 42      | 311     | 15             | 0       | 15      | (D)              | (D)       | 73      | (D)         | (D)        | 223     |
| Other transportation and<br>utilities.....                     | 40-42,44-47                         | (D)                   | (D)     | 211     | (D)            | (D)     | (D)     | (D)              | 0         | (D)     | 221         | 12         | 209     |
| Trade.....   | 50-59                               | 6,389                 | 51      | 6,338   | (D)            | (D)     | 405     | 1,462            | 0         | 1,462   | (D)         | (D)        | 4,471   |
| Finance, insurance, and<br>real estate.....                    | 60-65,67                            | (D)                   | (D)     | 1,280   | 12             | (D)     | (D)     | (D)              | 0         | (D)     | 1,177       | 2          | 1,174   |
| Services.....  | 701,72,73,<br>75-81,83,84,<br>87,89 | 19,022                | 3,118   | 15,904  | 1,699          | 360     | 1,339   | 3,952            | 1,006 (S) | 2,946   | 13,371      | 1,752 (S)  | 11,619  |

See explanatory information and SOURCE at end of table.

Table A-30. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1996

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| Industry  | SIC code                  | Total                 |           |         | Basic Research |         |         | Applied Research |         |         | Development |           |         |
|---|---------------------------|-----------------------|-----------|---------|----------------|---------|---------|------------------|---------|---------|-------------|-----------|---------|
|   |                           | Total                 | Federal   | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal   | Company |
|   |                           | [Dollars in millions] |           |         |                |         |         |                  |         |         |             |           |         |
| Business services.....  | 73                        | 10,641                | 361       | 10,280  | 593            | 84      | 509     | 1,328            | 51      | 1,277   | 8,720       | 226       | 8,494   |
| Computer and data processing services.....                                      | 737                       | (D)                   | (D)       | 10,025  | 550            | 84      | 467     | (D)              | (D)     | 1,244   | (D)         | (D)       | 8,314   |
| Other business services.....  | 731-736,738               | (D)                   | (D)       | 255     | 41             | 0       | 41      | (D)              | (D)     | 33      | (D)         | (D)       | 181     |
| Health services.....  | 80                        | (D)                   | (D)       | 735 (S) | (D)            | (D)     | 50      | (D)              | (D)     | 252 (S) | (D)         | (D)       | 433 (S) |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807               | 715 (S)               | 3         | 713 (S) | 48             | (D)     | (D)     | (D)              | (D)     | (D)     | (D)         | (D)       | (D)     |
| Other health services.....  | 802-805, 808-809          | (D)                   | (D)       | 23      | (D)            | 0       | (D)     | 12               | (D)     | (D)     | (D)         | 0         | (D)     |
| Engineering and management services..   | 87                        | 7,318                 | 2,746     | 4,572   | 1,029          | 274     | 757     | 2,324            | 949 (S) | 1,376   | 3,965       | 1,523 (S) | 2,439   |
| Engineering, architectural, and surveying.....                                  | 871                       | 1,660                 | 994       | 667     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | 943         | 546       | 398     |
| Research, development, and testing.....   | 873                       | 5,484                 | 1,708 (S) | 3,776   | 795            | 128     | 667     | 1,772            | 603 (S) | 1,168   | 2,917       | 977 (S)   | 1,941   |
| Other engineering and management services.....                                  | 872,874                   | 173                   | 45        | 129     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | 101         | 1         | 101     |
| Other services.....   | 701,72,75-79, 81,83,84,89 | (D)                   | (D)       | 317     | (D)            | (D)     | 25      | (D)              | (D)     | 42      | (D)         | (D)       | 250     |
| Other nonmanufacturing industries <sup>1</sup> .....                            | 07-12,14,15, 161-162,17   | (D)                   | (D)       | 1,156   | 46             | 0       | 46      | 547              | 218     | 329     | (D)         | (D)       | 781     |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**NOTE:** The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-31. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1997

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| Industry                                  | SIC code           | Total                 |         |         | Basic Research |         |         | Applied Research |         |         | Development |         |         |
|---|--------------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|-------------|---------|---------|
|   |                    | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal | Company |
|   |                    | [Dollars in millions] |         |         |                |         |         |                  |         |         |             |         |         |
| All Industries.....                       |                    | 157,539               | 23,928  | 133,611 | 10,419         | 1,654   | 8,766   | 32,642           | 2,861   | 29,782  | 114,478     | 19,412  | 95,064  |
| Manufacturing.....                        |                    | 121,025               | 19,823  | 101,202 | (D)            | (D)     | 6,245   | (D)              | (D)     | 22,672  | 89,492      | 17,204  | 72,287  |
| Food, kindred, and tobacco products ..... | 20,21              | 1,787                 | 0       | 1,787   | 128            | 0       | 128     | 462              | 0       | 462     | 1,197       | 0       | 1,197   |
| Textiles and apparel.....                 | 22,23              | (D)                   | (D)     | 476     | 41             | 0       | 41      | 34               | 0       | 34      | (D)         | (D)     | 401 (S) |
| Lumber, wood products, and furniture..... | 24,25              | 348                   | 0       | 348     | 30             | 0       | 30      | 36               | 0       | 36      | 282         | 0       | 282     |
| Paper and allied products.....            | 26                 | (D)                   | (D)     | 1,456   | 249            | 8       | 242     | (D)              | (D)     | 307     | (D)         | (D)     | 907     |
| Chemicals and allied products.....        | 28                 | (D)                   | (D)     | 18,628  | (D)            | (D)     | 2,710   | (D)              | (D)     | 5,103   | (D)         | (D)     | 10,815  |
| Industrial chemicals.....                 | 281-82,286         | (D)                   | (D)     | 4,970   | (D)            | (D)     | 727     | (D)              | (D)     | 1,470   | (D)         | (D)     | 2,773   |
| Drugs and medicines.....                  | 283                | 11,589                | 3 (S)   | 11,586  | (D)            | (D)     | 1,893   | 2,975            | 0       | 2,975   | (D)         | (D)     | 6,718   |
| Other chemicals.....                      | 284-85,<br>287-89  | (D)                   | (D)     | 2,072   | 91             | 0       | 91      | (D)              | (D)     | 658     | (D)         | (D)     | 1,324   |
| Petroleum refining and extraction.....    | 13,29              | (D)                   | (D)     | 1,612   | 75             | 0       | 75      | (D)              | (D)     | 666     | (D)         | (D)     | 871     |
| Rubber products.....                      | 30                 | (D)                   | (D)     | 1,372   | 67             | 0       | 67      | (D)              | (D)     | 235     | (D)         | (D)     | 1,071   |
| Stone, clay, and glass products.....      | 32                 | 608                   | 2       | 606     | (D)            | (D)     | 60      | (D)              | (D)     | 210     | (D)         | (D)     | 336     |
| Primary metals.....                       | 33                 | 988                   | 221     | 767     | (D)            | (D)     | 49      | (D)              | (D)     | 220     | 717         | 218 (S) | 499     |
| Ferrous metals and products.....          | 331-32,<br>3398-99 | (D)                   | (D)     | 414     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | 507         | 215 (S) | 292     |
| Nonferrous metals and products.....       | 333-36             | (D)                   | (D)     | 353     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     | 209         | 3       | 206     |

See explanatory information and SOURCE at end of table.

Table A-31. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1997

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| Industry   | SIC code          | Total                 |         |         | Basic Research |         |         | Applied Research |         |         | Development |         |         |
|--|-------------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|-------------|---------|---------|
|  |                   | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal | Company |
|  |                   | [Dollars in millions] |         |         |                |         |         |                  |         |         |             |         |         |
| Fabricated metal products.....                                 | 34                | 1,798                 | 129     | 1,669   | (D)            | (D)     | 124     | 472              | 112     | 360     | (D)         | (D)     | 1,185   |
| Machinery.....   | 35                | 18,499                | 106     | 18,393  | (D)            | (D)     | 589     | (D)              | (D)     | 4,638   | 13,231      | 66      | 13,165  |
| Office, computing, and<br>accounting machines.....             | 357               | 12,840                | 53      | 12,787  | (D)            | (D)     | 220     | (D)              | (D)     | 3,751   | (D)         | (D)     | 8,816   |
| Other machinery, except<br>electrical.....                     | 351-56,<br>358-59 | 5,659                 | 53      | 5,606   | 369            | 0       | 369     | (D)              | (D)     | 888     | (D)         | (D)     | 4,350   |
| Electrical equipment.....                                      | 36                | 24,585                | 1,839   | 22,747  | 954            | 33 (S)  | 921     | 6,878            | 592     | 6,285   | 16,753      | 1,212   | 15,540  |
| Radio and TV receiving<br>equipment.....                       | 365               | (D)                   | (D)     | 152     | 26             | 0       | 26      | (D)              | (D)     | 12 (S)  | (D)         | (D)     | 114     |
| Communication equipment.....                                   | 366               | (D)                   | (D)     | 7,377   | (D)            | (D)     | 148     | 1,107            | 0       | 1,107   | 6,784       | 662     | 6,122   |
| Electronic components.....                                     | 367               | (D)                   | (D)     | 10,786  | 428            | 0       | 428     | 4,658            | 481 (S) | 4,177   | (D)         | (D)     | 6,180   |
| Other electrical equipment.....                                | 361-64,369        | 4,909                 | 477     | 4,432   | (D)            | (D)     | 318     | (D)              | (D)     | 989     | 3,474       | 349     | 3,125   |
| Transportation equipment.....                                  | 37                | 31,993                | 12,251  | 19,742  | (D)            | (D)     | 135     | (D)              | (D)     | 2,303   | 27,945      | 10,640  | 17,304  |
| Motor vehicles and motor<br>vehicles equipment.....            | 371               | (D)                   | (D)     | 13,758  | 103            | (D)     | (D)     | (D)              | (D)     | (D)     | (D)         | (D)     | 12,960  |
| Other transportation<br>equipment.....                         | 373-75,379        | (D)                   | (D)     | 307     | (D)            | 0       | (D)     | (D)              | 0       | (D)     | (D)         | (D)     | 185     |
| Aircraft and missiles.....                                     | 372,376           | 16,296                | 10,619  | 5,677   | (D)            | (D)     | 10      | (D)              | (D)     | 1,508   | 13,275      | 9,115   | 4,159   |
| Professional and scientific<br>instruments.....                | 38                | 13,458                | 4,499   | 8,958   | (D)            | (D)     | 942     | 1,377            | 91      | 1,286   | (D)         | (D)     | 6,729   |
| Scientific and mechanical<br>measuring instruments.....        | 381-82            | 8,135                 | 4,416   | 3,719   | (D)            | (D)     | 407     | 563              | 49 (S)  | 515     | (D)         | (D)     | 2,797   |
| Optical, surgical, photographic,<br>and other instruments..... | 384-87            | 5,323                 | 84      | 5,240   | (D)            | (D)     | 535     | 814              | 42      | 772     | (D)         | (D)     | 3,932   |
| Other manufacturing<br>industries <sup>1</sup> .....           | 27,31,39          | 2,798                 | 156     | 2,642   | 133            | 0       | 133     | 548              | 21      | 528     | 2,117       | 135     | 1,982   |
| Nonmanufacturing.....  |                   | 36,514                | \$4,105 | 32,409  | (D)            | (D)     | 2,521   | (D)              | (D)     | \$7,110 | 24,986      | 2,207   | 22,777  |

See explanatory information and SOURCE at end of table.

Table A-31. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1997

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| Industry  | SIC code                           | Total                 |           |         | Basic Research |         |         | Applied Research |         |         | Development |         |         |
|---|------------------------------------|-----------------------|-----------|---------|----------------|---------|---------|------------------|---------|---------|-------------|---------|---------|
|   |                                    | Total                 | Federal   | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal | Company |
|   |                                    | [Dollars in millions] |           |         |                |         |         |                  |         |         |             |         |         |
| Transportation and utilities.....   | 40-42,44-49                        | 3,013                 | 200       | 2,812   | 164            | 0       | 164     | (D)              | (D)     | 1,023   | (D)         | (D)     | 1,625   |
| Communications.....   | 48                                 | (D)                   | (D)       | 1,884   | (D)            | 0       | (D)     | (D)              | 0       | (D)     | (D)         | (D)     | 1,174   |
| Telephone communications.....   | 481                                | (D)                   | (D)       | 1,826   | (D)            | 0       | (D)     | (D)              | 0       | (D)     | (D)         | (D)     | 1,144   |
| Other communications.....   | 482-484,489                        | 58                    | 0         | 58      | (D)            | 0       | (D)     | (D)              | 0       | (D)     | 30          | \$0     | 30      |
| Electric, gas, and sanitary services.....                                       | 49                                 | (D)                   | (D)       | 258     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     | (D)         | (D)     | 170     |
| Other transportation and utilities.....   | 40-42,44-47                        | (D)                   | (D)       | 670     | (D)            | 0       | (D)     | (D)              | 0       | (D)     | (D)         | (D)     | 281     |
| Trade.....  | 50-59                              | (D)                   | (D)       | 7,961   | (D)            | (D)     | 943     | (D)              | (D)     | 2,016   | (D)         | (D)     | 5,003   |
| Finance, insurance, and real estate.....  | 60-65,67                           | (D)                   | (D)       | 1,500   | 13             | 0       | 13      | (D)              | (D)     | 45      | 1,442       | 0       | 1,442   |
| Services.....   | 701,72,73,<br>75-8183,84,<br>87,89 | 22,400                | 3,805     | 18,594  | 1,951          | 665     | 1,286   | 4,866            | 1,160   | 3,705   | 15,583      | 1,979   | 13,604  |
| Business services.....  | 73                                 | 11,960                | 400       | 11,560  | (D)            | (D)     | 634     | (D)              | (D)     | 1,279   | 9,874       | 227     | 9,647   |
| Computer and data processing services.....                                      | 737                                | 11,706                | 389       | 11,318  | 646            | 18      | 628     | 1,404            | 155     | 1,249   | 9,656       | 216     | 9,441   |
| Other business services.....  | 731-736,738                        | 254                   | 11        | 242     | (D)            | (D)     | 6       | (D)              | (D)     | 30      | 218         | 11      | 207     |
| Health services.....  | 80                                 | (D)                   | (D)       | 679     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     | (D)         | 0       | (D)     |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                        | (D)                   | 4         | (D)     | 15             | 0       | 15      | (D)              | 4       | (D)     | (D)         | 0       | (D)     |
| Other health services.....  | 802-805,<br>808-809                | 49                    | (D)       | (D)     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     | 11          | 0       | 11      |
| Engineering and management services   | 87                                 | 9,290                 | 3,381 (S) | 5,909   | 1,273          | 645     | 627     | 3,120            | 993     | 2,127   | 4,898       | 1,742   | 3,156   |
| Engineering, architectural, and surveying.....                                  | 871                                | 2,039                 | 1,258     | 781     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | 1,223       | 705     | 518     |
| Research, development, and testing.....   | 873                                | (D)                   | (D)       | 4,782   | 1,031          | 475     | 556     | 2,353            | 611     | 1,742   | (D)         | (D)     | 2,484   |
| Other engineering and management services.....                                  | 872,874                            | (D)                   | (D)       | 347     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | (D)         | (D)     | 154     |

See explanatory information and SOURCE at end of table.

**Table A-31. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1997**

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| Industry   | SIC code                     | Total                 |         |         | Basic Research |         |         | Applied Research |         |         | Development |         |         |
|--|------------------------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|-------------|---------|---------|
|  |                              | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company | Total       | Federal | Company |
|  |                              | [Dollars in millions] |         |         |                |         |         |                  |         |         |             |         |         |
| Other services.....                                  | 701,72,75-79,<br>81,83,84,89 | (D)                   | (D)     | 446     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     | (D)         | 10      | (D)     |
| Other nonmanufacturing industries <sup>1</sup> ..... | 07-12,14,15,<br>161-162,17   | 1,618                 | 77      | 1,541   | 128            | 12      | 116     | 372              | 51      | 321     | 1,118       | 14      | 1,104   |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**NOTE:** The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-32. Number of companies conducting industrial basic research and total number of R&amp;D-performing companies, by industry and size of company: 1997

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| Industry  | SIC code       | Size of company |       |                          |       |                      |       |                          |       |                          |       |                            |       |                          |       |
|---|----------------|-----------------|-------|--------------------------|-------|----------------------|-------|--------------------------|-------|--------------------------|-------|----------------------------|-------|--------------------------|-------|
|   |                | Total           |       | Fewer than 500 employees |       | 500 to 999 employees |       | 1,000 to 4,999 employees |       | 5,000 to 9,999 employees |       | 10,000 to 24,999 employees |       | 25,000 or more employees |       |
|   |                | Total           | Basic | Total                    | Basic | Total                | Basic | Total                    | Basic | Total                    | Basic | Total                      | Basic | Total                    | Basic |
| All Industries.....                             |                | 35,112          | 6,820 | 31,995                   | 6,310 | 1,127                | 140   | 1,302                    | 232   | 322                      | 49    | 199                        | 63    | 167                      | 25    |
| Manufacturing.....                              |                | 18,130          | 3,302 | 15,898                   | 2,923 | 886                  | 110   | 938                      | 163   | 197                      | 38    | 138                        | 47    | 73                       | 21    |
| Food, kindred, and tobacco products.....        | 20,21          | 696             | 137   | 426                      | 105   | 112                  | 10    | 115                      | 10    | 17                       | 5     | 15                         | 4     | 11                       | 2     |
| Textiles and apparel.....                       | 22,23          | 278             | 147   | 181                      | 131   | 44                   | 4     | 41                       | 9     | 3                        | 0     | 7                          | 3     | 2                        | 0     |
| Lumber, wood products, and furniture.....       | 24,25          | 257             | 27    | 162                      | 2     | 52                   | 18    | 29                       | 4     | 10                       | 1     | 4                          | 1     | 0                        | 0     |
| Paper and allied products.....                  | 26             | 121             | 41    | 57                       | 32    | 2                    | 0     | 41                       | 4     | 6                        | 2     | 9                          | 2     | 6                        | 1     |
| Chemicals and allied products.....              | 28             | 602             | 102   | 424                      | 42    | 32                   | 10    | 95                       | 29    | 27                       | 9     | 17                         | 10    | 6                        | 3     |
| Industrial chemicals.....                       | 281-82,286     | 161             | 43    | 91                       | 18    | 8                    | 4     | 42                       | 11    | 11                       | 3     | 7                          | 5     | 2                        | 2     |
| Drugs and medicines.....                        | 283            | 199             | 18    | 159                      | 1     | 3                    | 1     | 22                       | 7     | 7                        | 4     | 5                          | 4     | 3                        | 1     |
| Other chemicals.....                            | 284-85,28-89   | 242             | 41    | 174                      | 23    | 21                   | 5     | 32                       | 11    | 9                        | 2     | 5                          | 1     | 1                        | 0     |
| Petroleum refining and extraction.....          | 13,29          | 26              | 7     | 2                        | 0     | 3                    | 0     | 11                       | 3     | 0                        | 0     | 7                          | 2     | 3                        | 2     |
| Rubber products.....                            | 30             | 639             | 71    | 459                      | 54    | 93                   | 4     | 73                       | 10    | 7                        | 0     | 5                          | 2     | 2                        | 1     |
| Stone, clay, and glass products.....            | 32             | 98              | 63    | 65                       | 50    | 10                   | 0     | 13                       | 6     | 5                        | 3     | 5                          | 4     | 0                        | 0     |
| Primary metals.....                             | 33             | 250             | 16    | 126                      | 8     | 63                   | 1     | 31                       | 4     | 17                       | 2     | 10                         | 0     | 3                        | 1     |
| Ferrous metals and products.....                | 331-32,3398-99 | 54              | 3     | 11                       | 0     | 4                    | 0     | 17                       | 3     | 14                       | 0     | 8                          | 0     | 1                        | 0     |
| Nonferrous metals and products.....             | 333-36         | 196             | 13    | 116                      | 8     | 59                   | 1     | 14                       | 1     | 3                        | 2     | 2                          | 0     | 2                        | 1     |
| Fabricated metal products.....                  | 34             | 903             | 163   | 731                      | 131   | 74                   | 13    | 74                       | 16    | 10                       | 0     | 11                         | 3     | 2                        | 0     |
| Machinery.....                                  | 35             | 1,536           | 391   | 1,233                    | 340   | 108                  | 21    | 144                      | 21    | 28                       | 4     | 18                         | 4     | 5                        | 1     |
| Office, computing, and accounting machines..... | 357            | 119             | 9     | 77                       | 1     | 10                   | 1     | 16                       | 4     | 8                        | 1     | 6                          | 1     | 2                        | 1     |
| Other machinery, except electrical.....         | 351-56,358-59  | 1,417           | 382   | 1,156                    | 339   | 98                   | 20    | 128                      | 17    | 20                       | 3     | 12                         | 3     | 3                        | 0     |
| Electrical equipment.....                       | 36             | 1,547           | 232   | 1,217                    | 185   | 140                  | 16    | 136                      | 17    | 33                       | 7     | 11                         | 3     | 11                       | 4     |
| Radio and TV receiving equipment.....           | 365            | 19              | 4     | 14                       | 3     | 2                    | 0     | 3                        | 1     | 0                        | 0     | 0                          | 0     | 0                        | 0     |
| Communication equipment.....                    | 366            | 322             | 60    | 255                      | 53    | 25                   | 2     | 23                       | 3     | 16                       | 1     | 0                          | 0     | 3                        | 1     |
| Electronic components.....                      | 367            | 748             | 96    | 625                      | 81    | 60                   | 5     | 46                       | 6     | 10                       | 2     | 5                          | 2     | 2                        | 0     |
| Other electrical equipment.....                 | 361-64,369     | 460             | 72    | 323                      | 48    | 54                   | 9     | 64                       | 7     | 7                        | 4     | 6                          | 1     | 6                        | 3     |

See explanatory information and SOURCE at end of table.

Table A-32. Number of companies conducting industrial basic research and total number of R&amp;D-performing companies, by industry and size of company: 1997

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| Industry  | SIC code                        | Size of company |       |                          |       |                      |       |                          |       |                          |       |                            |       |                          |       |
|---|---------------------------------|-----------------|-------|--------------------------|-------|----------------------|-------|--------------------------|-------|--------------------------|-------|----------------------------|-------|--------------------------|-------|
|   |                                 | Total           |       | Fewer than 500 employees |       | 500 to 999 employees |       | 1,000 to 4,999 employees |       | 5,000 to 9,999 employees |       | 10,000 to 24,999 employees |       | 25,000 or more employees |       |
|   |                                 | Total           | Basic | Total                    | Basic | Total                | Basic | Total                    | Basic | Total                    | Basic | Total                      | Basic | Total                    | Basic |
| Transportation equipment.....                               | 37                              | 411             | 116   | 302                      | 100   | 54                   | 2     | 18                       | 3     | 14                       | 2     | 10                         | 5     | 13                       | 4     |
| Motor vehicles and motor vehicles equipment.....            | 371                             | 377             | 107   | 300                      | 100   | 51                   | 0     | 6                        | 1     | 8                        | 1     | 8                          | 4     | 4                        | 1     |
| Other transportation equipment.....                         | 373-75,379                      | 10              | 3     | 0                        | 0     | 2                    | 2     | 4                        | 0     | 1                        | 0     | 1                          | 1     | 2                        | 0     |
| Aircraft and missiles.....                                  | 372,376                         | 24              | 6     | 2                        | 0     | 1                    | 0     | 8                        | 2     | 5                        | 1     | 1                          | 0     | 7                        | 3     |
| Professional and scientific instruments....                 | 38                              | 760             | 142   | 611                      | 109   | 58                   | 10    | 74                       | 17    | 10                       | 3     | 3                          | 2     | 5                        | 1     |
| Scientific and mechanical measuring instruments.....        | 381-82                          | 515             | 79    | 440                      | 62    | 37                   | 8     | 29                       | 6     | 4                        | 1     | 2                          | 1     | 3                        | 0     |
| Optical, surgical, photographic, and other instruments..... | 384-87                          | 246             | 63    | 171                      | 47    | 21                   | 1     | 45                       | 11    | 6                        | 2     | 1                          | 1     | 2                        | 1     |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                        | 10,005          | 1,647 | 9,901                    | 1,633 | 40                   | 1     | 44                       | 11    | 10                       | 0     | 6                          | 2     | 4                        | 1     |
| Nonmanufacturing.....                                       |                                 | 16,982          | 3,519 | 16,097                   | 3,387 | 241                  | 31    | 364                      | 69    | 125                      | 11    | 61                         | 16    | 94                       | 4     |
| Transportation and utilities.....                           | 40-42,44-49                     | 417             | 117   | 204                      | 104   | 5                    | 1     | 65                       | 6     | 67                       | 2     | 10                         | 2     | 66                       | 2     |
| Communications.....   | 48                              | 90              | 7     | 24                       | 4     | 2                    | 1     | 4                        | 1     | 51                       | 0     | 0                          | 0     | 9                        | 1     |
| Telephone communications.....                               | 481                             | 59              | 1     | 0                        | 0     | 0                    | 0     | 0                        | 0     | 51                       | 0     | 0                          | 0     | 8                        | 1     |
| Other communications.....                                   | 482-484,489                     | 31              | 6     | 24                       | 4     | 2                    | 1     | 4                        | 1     | 0                        | 0     | 0                          | 0     | 1                        | 0     |
| Electric, gas, and sanitary services....                    | 49                              | 161             | 56    | 77                       | 49    | 2                    | 0     | 57                       | 4     | 14                       | 1     | 9                          | 2     | 2                        | 0     |
| Other transportation and utilities.....                     | 40-42,44-47                     | 166             | 54    | 103                      | 51    | 1                    | 0     | 4                        | 1     | 2                        | 1     | 1                          | 0     | 55                       | 1     |
| Trade.....  | 50-59                           | 3,713           | 972   | 3,567                    | 938   | 14                   | 1     | 73                       | 15    | 20                       | 5     | 30                         | 12    | 10                       | 1     |
| Finance, insurance, and real estate.....                    | 60-65,67                        | 382             | 68    | 309                      | 55    | 31                   | 3     | 23                       | 9     | 9                        | 0     | 3                          | 0     | 7                        | 1     |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 4,891           | 819   | 4,482                    | 755   | 182                  | 25    | 179                      | 33    | 20                       | 3     | 17                         | 2     | 11                       | 0     |
| Business services.....                                      | 73                              | 2,455           | 238   | 2,276                    | 217   | 84                   | 8     | 65                       | 11    | 14                       | 2     | 5                          | 0     | 10                       | 0     |
| Computer and data processing services.....                  | 737                             | 2,273           | 228   | 2,144                    | 214   | 63                   | 6     | 51                       | 7     | 10                       | 2     | 3                          | 0     | 3                        | 0     |
| Other business services.....                                | 731-736,738                     | 181             | 9     | 133                      | 3     | 22                   | 2     | 14                       | 4     | 4                        | 0     | 2                          | 0     | 7                        | 0     |

See explanatory information and SOURCE at end of table.

Table A-32. Number of companies conducting industrial basic research and total number of R&amp;D-performing companies, by industry and size of company: 1997

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| Industry  | SIC code                  | Size of company |       |                          |       |                      |       |                          |       |                          |       |                            |       |                          |       |
|---|---------------------------|-----------------|-------|--------------------------|-------|----------------------|-------|--------------------------|-------|--------------------------|-------|----------------------------|-------|--------------------------|-------|
|   |                           | Total           |       | Fewer than 500 employees |       | 500 to 999 employees |       | 1,000 to 4,999 employees |       | 5,000 to 9,999 employees |       | 10,000 to 24,999 employees |       | 25,000 or more employees |       |
|   |                           | Total           | Basic | Total                    | Basic | Total                | Basic | Total                    | Basic | Total                    | Basic | Total                      | Basic | Total                    | Basic |
| Health services.....  | 80                        | 483             | 109   | 456                      | 104   | 3                    | 1     | 21                       | 3     | 0                        | 0     | 3                          | 1     | 0                        | 0     |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807               | 427             | 107   | 404                      | 103   | 3                    | 1     | 17                       | 2     | 0                        | 0     | 3                          | 1     | 0                        | 0     |
| Other health services.....  | 802-805,808-809           | 56              | 2     | 52                       | 1     | 0                    | 0     | 4                        | 1     | 0                        | 0     | 0                          | 0     | 0                        | 0     |
| Engineering and management services.....  | 87                        | 1,569           | 402   | 1,495                    | 383   | 42                   | 15    | 23                       | 3     | 3                        | 1     | 5                          | 1     | 1                        | 0     |
| Engineering, architectural, and surveying.....                                  | 871                       | 697             | 150   | 661                      | 145   | 14                   | 2     | 18                       | 2     | 1                        | 1     | 3                          | 0     | 0                        | 0     |
| Research, development, and testing.....   | 873                       | 727             | 246   | 711                      | 238   | 13                   | 7     | 2                        | 1     | 0                        | 0     | 0                          | 0     | 1                        | 0     |
| Other engineering and management services.....                                  | 872,874                   | 145             | 7     | 123                      | 0     | 15                   | 6     | 3                        | 0     | 2                        | 0     | 2                          | 1     | 0                        | 0     |
| Other services.....   | 701,72,75-79,81, 83,84,89 | 385             | 70    | 255                      | 52    | 53                   | 2     | 70                       | 16    | 3                        | 0     | 4                          | 0     | 0                        | 0     |
| Other nonmanufacturing industries <sup>1</sup> .....                            | 07-12,14,15, 161-162,17   | 7,579           | 1,542 | 7,535                    | 1,535 | 8                    | 0     | 24                       | 6     | 9                        | 1     | 1                          | 0     | 1                        | 0     |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-33. Funds for industrial applied R&D performance, by product field and source of funds: 1997**

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| Product field  | SIC code        | Total                 | Federal | Company |
|--|-----------------|-----------------------|---------|---------|
|  |                 | [Dollars in millions] |         |         |
| Total.....   |                 | 60,858                | 4,114   | 56,744  |
| Food and kindred products.....                                   | 20              | 763                   | (D)     | (D)     |
| Textile mill products.....                                       | 22              | 267 (S)               | (D)     | (D)     |
| Chemicals and allied products.....                               | 28              | 9,821                 | 26      | 9,794   |
| Industrial inorganic and organic chemicals.....                  | 281,286         | 654                   | 4       | 650     |
| Plastics materials and synthetic resins, rubber, and fibers..... | 282             | 1,092                 | (D)     | (D)     |
| Drugs and medicines.....   | 283             | 6,575                 | 6       | 6,569   |
| Agricultural chemicals.....                                      | 287             | 562                   | 0       | 562     |
| Other chemicals.....   | 284-85,289      | 937                   | (D)     | (D)     |
| Petroleum refining.....  | 29              | 679                   | (D)     | (D)     |
| Rubber and miscellaneous plastics products.....                  | 30              | 337                   | (D)     | (D)     |
| Stone, clay, and glass products.....                             | 32              | 117                   | 5       | 112     |
| Primary metals.....  | 33              | 217                   | 8       | 210     |
| Ferrous metals and products.....                                 | 331-32,3398-99  | 117                   | (D)     | (D)     |
| Nonferrous metals and products.....                              | 333-36          | 100                   | (D)     | (D)     |
| Fabricated metal products.....                                   | 34              | 455                   | 128     | 327     |
| Ordnance and accessories, n.e.c.....                             | 348             | 31                    | (D)     | (D)     |
| Other fabricated metal products.....                             | 341-47,349      | 424                   | (D)     | (D)     |
| Machinery.....   | 35              | 7,894                 | 513     | 7,381   |
| Engines and turbines.....  | 351             | 1,538                 | (D)     | (D)     |
| Farm machinery and equipment.....                                | 352             | 320                   | 311     | 311     |
| Construction, mining, and materials handling machinery.....      | 353             | 420                   | (D)     | (D)     |
| Metalworking machinery and equipment.....                        | 354             | 128                   | (D)     | (D)     |
| Office, computing, and accounting machines.....                  | 357             | 4,835                 | (D)     | (D)     |
| Other machinery, except electrical.....                          | 355-56,358-59   | 651                   | (D)     | (D)     |
| Electrical equipment.....  | 36              | 14,826                | 771     | 14,055  |
| Electric transmission and distribution equipment.....            | 361,3825        | 223                   | (D)     | (D)     |
| Electrical industrial apparatus.....                             | 362             | 253                   | (D)     | (D)     |
| Radio and TV receiving equipment.....                            | 365             | 219                   | (D)     | (D)     |
| Communication equipment.....                                     | 366             | 5,569                 | 307     | 5,262   |
| Electronic components.....                                       | 367             | 7,763                 | 361     | 7,403   |
| Other electrical equipment and supplies.....                     | 363-64,368-69   | 798                   | 2       | 796     |
| Transportation equipment.....                                    | 37              | 10,295                | 1,130   | 9,165   |
| Motor vehicles and equipment.....                                | 371             | 7,901                 | (D)     | (D)     |
| Other transportation equipment.....                              | 373-75,379      | 135                   | (D)     | (D)     |
| Aircraft and parts.....  | 372             | 1,551                 | (D)     | (D)     |
| Guided missiles and spacecraft.....                              | 376             | 708                   | 606     | 102     |
| Professional and scientific instruments.....                     | 38, except 3825 | 2,426                 | 357     | 2,069   |
| Scientific and mechanical measuring instruments.....             | 381-82          | 1,491                 | (D)     | (D)     |
| Optical, surgical, photographic, and other instruments.....      | 383-87          | 935                   | (D)     | (D)     |

See explanatory information and SOURCE at end of table.

**Table A-33. Funds for industrial applied R&D performance, by product field and source of funds: 1997**

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| Product field                     | SIC code | Total                 | Federal | Company |
|-----------------------------------|----------|-----------------------|---------|---------|
|                                   |          | [Dollars in millions] |         |         |
| Lumber and wood products.....     | 24       | 28                    | 0       | 28      |
| Paper and allied products.....    | 26       | 305                   | (D)     | (D)     |
| Leather.....                      | 31       | 36                    | 0       | 36      |
| Software.....                     | 737      | 6,330                 | 159     | 6,171   |
| Other product fields, n.e.c. .... | -        | 6,063                 | 978     | 5,085   |

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

Other product fields, n.e.c. = Not elsewhere classified.

**NOTE:** Imputation of R&D expenditures by product field was eliminated beginning in 1985. This table, therefore, contains only applied research and development data reported by survey respondents who received Form RD-1L. See Table A-34 for coverage ratios showing the percentage of each industry's applied research and development funds that respondents distributed by product field.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-34. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and product field: 1997

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| Industry and size of company                    | SIC code       | Coverage ratio | Applied R&D Total | Food and kindred products | Textile mill products | Paper and allied products | Chemicals | Petroleum refining and oil and gas extraction | Rubber products |
|---|----------------|----------------|-------------------|---------------------------|-----------------------|---------------------------|-----------|---|-----------------|
|   |                |                |                   | 20                        | 22                    | 26                        |           | 29, 13  | 30              |
| [Dollars in millions]                           |                |                |                   |                           |                       |                           |           |   |                 |
| All Industries.....                             |                | 0.62           | 60,858            | 763                       | 267 (S)               | 305                       | 9,821     | 679   | 337             |
| Distribution by industry:                       |                |                |                   |                           |                       |                           |           |   |                 |
| Manufacturing.....                              |                | 0.71           | 12,139            | 670                       | 262 (S)               | 300                       | 8,105     | 487   | (D)             |
| Food, kindred, and tobacco products.....        | 20,21          | 0.53           | 543               | 543                       | (D)                   | (D)                       | (D)       | 0   | 0               |
| Textiles and apparel.....                       | 22,23          | 0.70           | 102               | (D)                       | 81                    | 0                         | 8         | 0   | 0               |
| Lumber, wood products, and furniture.....       | 24,25          | 0.34           | 0                 | 0                         | 0                     | 0                         | 0         | 0   | 0               |
| Paper and allied products.....                  | 26             | 0.55           | 171               | 0                         | (D)                   | 159                       | (D)       | 0   | 12              |
| Chemicals and allied products.....              | 28             | 0.69           | 7,597             | 116                       | (D)                   | (D)                       | 7,481     | (D)   | (D)             |
| Industrial chemicals.....                       | 281-82,286     | 0.73           | 0 (S)             | (D)                       | (D)                   | (D)                       | (D)       | (D)   | (D)             |
| Drugs and medicines.....                        | 283            | 0.67           | 0                 | (D)                       | (D)                   | 0                         | (D)       | 0   | 0               |
| Other chemicals.....                            | 284-85,287-89  | 0.69           | 5                 | (D)                       | (D)                   | (D)                       | (D)       | 0   | 0               |
| Petroleum refining and extraction.....          | 13,29          | 0.96           | 425               | 0                         | (D)                   | 0                         | (D)       | 425   | (D)             |
| Rubber products.....                            | 30             | 0.46           | 273               | 0                         | 3                     | (D)                       | (D)       | (D)   | 255             |
| Stone, clay, and glass products.....            | 32             | 0.91           | 82                | 0                         | 0                     | (D)                       | (D)       | 0   | 0               |
| Primary metals.....                             | 33             | 0.74           | 200               | 0                         | 0                     | 0                         | (D)       | (D)   | (D)             |
| Ferrous metals and products.....                | 331-32,3398-99 | 0.86           | 0                 | 0                         | 0                     | 0                         | (D)       | (D)   | 0               |
| Nonferrous metals and products.....             | 333-36         | 0.42           | 17                | 0                         | 0                     | 0                         | (D)       | 0   | (D)             |
| Fabricated metal products.....                  | 34             | 0.66           | 136               | 0                         | (D)                   | 0                         | (D)       | 0   | 12              |
| Machinery.....                                  | 35             | 0.78           | 4,878             | 0                         | 0                     | 0                         | (D)       | (D)   | (D)             |
| Office, computing, and accounting machines..... | 357            | 0.80           | 0                 | 0                         | 0                     | 0                         | 0         | 0   | 0               |
| Other machinery, except electrical.....         | 351-56,358-59  | 0.75           | 56                | 0                         | 0                     | 0                         | (D)       | (D)   | (D)             |
| Electrical equipment.....                       | 36             | 0.65           | 60                | 0                         | 0                     | 0                         | (D)       | 0   | (D)             |
| Radio and TV receiving equipment.....           | 365            | 0.49           | 0                 | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Communication equipment.....                    | 366            | 0.63           | 0                 | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Electronic components.....                      | 367            | 0.69           | 0                 | 0                         | 0                     | 0                         | (D)       | 0   | (D)             |
| Other electrical equipment.....                 | 361-64,369     | 0.63           | 770               | 0                         | 0                     | 0                         | (D)       | 0   | (D)             |

See explanatory information and SOURCE at end of table.

Table A-34. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and product field: 1997

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| Industry and size of company                                | SIC code                        | Coverage ratio | Applied R&D Total | Food and kindred products | Textile mill products | Paper and allied products | Chemicals | Petroleum refining and oil and gas extraction | Rubber products |
|---|---------------------------------|----------------|-------------------|---------------------------|-----------------------|---------------------------|-----------|---|-----------------|
|   |                                 |                |                   | 20                        | 22                    | 26                        |           | 29, 13  | 30              |
| [Dollars in millions]                                       |                                 |                |                   |                           |                       |                           |           |   |                 |
| Distribution by industry:                                   |                                 |                |                   |                           |                       |                           |           |   |                 |
| Transportation equipment.....                               | 37                              | 0.85           | 0                 | (D)                       | (D)                   | 0                         | (D)       | (D)   | (D)             |
| Motor vehicles and motor vehicles equipment.....            | 371                             | (D)            | (D)               | (D)                       | 0                     | 0                         | (D)       | 0   | 0               |
| Other transportation equipment.....                         | 373-75,379                      | 0.80           | (D)               | (D)                       | 0                     | 0                         | 0         | 0   | 0               |
| Aircraft and missiles.....                                  | 372,376                         | 0.29           | 0                 | 0                         | (D)                   | 0                         | (D)       | (D)   | (D)             |
| Professional and scientific instruments.....                | 38                              | 0.60           | 2,553             | 0                         | (D)                   | 0                         | (D)       | (D)   | (D)             |
| Scientific and mechanical measuring instruments.....        | 381-82                          | 1.12           | 0 (S)             | 0                         | 0                     | 0                         | (D)       | (D)   | (D)             |
| Optical, surgical, photographic, and other instruments..... | 384-87                          | 0.24           | 0                 | 0                         | (D)                   | 0                         | (D)       | 0   | (D)             |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                        | 0.12           | 21                | 0                         | (D)                   | 17                        | (D)       | 0   | (D)             |
| Nonmanufacturing.....                                       |                                 | 0.37           | 2,124             | 94                        | 6                     | 5                         | 1,716     | 192   | (D)             |
| Transportation and utilities.....                           | 40-42,44-49                     | 0.25           | 304               | 0                         | (D)                   | 0                         | (D)       | 0   | (D)             |
| Communications.....   | 48                              | 0.24           | 0                 | 0                         | 0                     | 0                         | 0         | 0   | 0               |
| Telephone communications.....                               | 481                             | 0.24           | (D)               | 0                         | 0                     | 0                         | 0         | 0   | 0               |
| Other communications.....                                   | 482-484,489                     | 0.23           | (D)               | 0                         | 0                     | 0                         | 0         | 0   | 0               |
| Electric, gas, and sanitary services.....                   | 49                              | 0.79           | 113               | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Other transportation and utilities.....                     | 40-42,44-47                     | 0.04           | 0                 | 0                         | (D)                   | 0                         | (D)       | 0   | (D)             |
| Trade.....  | 50-59                           | 0.30           | 442               | 10                        | 2                     | (D)                       | (D)       | (D)   | 0               |
| Finance, insurance, and real estate.....                    | 60-65,67                        | 0.29           | 294               | 1                         | 0                     | 0                         | (D)       | 0   | 0               |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 0.44           | 88                | (D)                       | (D)                   | (D)                       | (D)       | (D)   | 0               |
| Business services.....                                      | 73                              | 0.45           | 4,458             | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Computer and data processing services.....                  | 737                             | 0.44           | 0                 | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Other business services.....                                | 731-736,738                     | 0.70           | 0                 | 0                         | 0                     | 0                         | 0         | 0   | 0               |

See explanatory information and SOURCE at end of table.

Table A-34. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and product field: 1997

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| Industry and size of company   | SIC code                     | Coverage ratio | Applied R&D Total | Food and kindred products | Textile mill products | Paper and allied products | Chemicals | Petroleum refining and oil and gas extraction | Rubber products |
|--|------------------------------|----------------|-------------------|---------------------------|-----------------------|---------------------------|-----------|---|-----------------|
|  |                              |                |                   | 20                        | 22                    | 26                        |           | 29, 13  | 30              |
| [Dollars in millions]  |                              |                |                   |                           |                       |                           |           |   |                 |
| Distribution by industry:  |                              |                |                   |                           |                       |                           |           |   |                 |
| Health services.....   | 80                           | (D)            | 22                | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                  | (D)            | (D)               | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Other health services.....   | 802-805,808-809              | 0.63           | (D)               | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Engineering and management services.....   | 87                           | 0.45           | 63                | (D)                       | (D)                   | (D)                       | (D)       | (D)   | 0               |
| Engineering, architectural, and<br>surveying .....                                 | 871                          | 0.38           | 195               | 0                         | 0                     | 0                         | (D)       | (D)   | 0               |
| Research, development, and testing.....  | 873                          | 0.50           | 0                 | (D)                       | (D)                   | (D)                       | (D)       | (D)   | 0               |
| Other engineering and<br>management services .....                                 | 872,874                      | 0.08           | 17                | 0                         | 0                     | 0                         | (D)       | 0   | 0               |
| Other services.....  | 701,72,75-79,81,<br>83,84,89 | 0.24           | 0                 | 0                         | 0                     | 0                         | 0         | 0   | 0               |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17   | 0.16           | 20                | (D)                       | 0                     | 0                         | (D)       | (D)   | 0               |
| Distribution by size of company:<br>[Number of employees]                          |                              |                |                   |                           |                       |                           |           |   |                 |
| Total.....   |                              | 1.00           | 60,859            | 763                       | 267 (S)               | 305                       | 9,821     | 679   | 337             |
| Fewer than 500.....  |                              | 0.20           | 278               | (D)                       | 12                    | 7                         | (D)       | (D)   | 7               |
| 500 to 999.....  |                              | 0.57           | 477               | 8                         | 11                    | (D)                       | 240       | (D)   | 15              |
| 1,000 to 4,999.....  |                              | 0.64           | 5,268             | 74                        | 50                    | 79                        | (D)       | 72  | 109             |
| 5,000 to 9,999.....  |                              | 0.68           | 308               | 200                       | 10                    | 16                        | (D)       | 0   | 27              |
| 10,000 to 24,999.....  |                              | 0.69           | 589               | 151                       | (D)                   | 50                        | (D)       | 328   | (D)             |
| 25,000 or more.....  |                              | 0.77           | 241               | (D)                       | (D)                   | (D)                       | (D)       | 241   | (D)             |

See explanatory information and SOURCE at end of table.

Table A-34. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and product field: 1997

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| Industry  | SIC code       | Stone, clay<br>and glass<br>products | Primary<br>metals | Fabricated<br>metal<br>products | Machinery | Electrical<br>equipment | Transportation<br>equipment | Professional<br>and scientific<br>instruments | Other product<br>fields<br>n.e.c. |
|---|----------------|--------------------------------------|-------------------|---------------------------------|-----------|-------------------------|-----------------------------|---|-----------------------------------|
|   |                | 32                                   | 33                | 34                              | 35        | 36                      | 37                          | 38  | ...                               |
| [Dollars in millions]                               |                |                                      |                   |                                 |           |                         |                             |   |                                   |
| All Industries.....                                 |                | 117                                  | 217               | 455                             | 7,894     | 14,826                  | 10,295                      | 2,426   | 12,457                            |
| Distribution by industry:                           |                |                                      |                   |                                 |           |                         |                             |   |                                   |
| Manufacturing.....                                  |                | (D)                                  | (D)               | (D)                             | (D)       | (D)                     | (D)                         | 2,315   | (D)                               |
| Food, kindred, and tobacco products.....            | 20,21          | 0                                    | 0                 | 0                               | (D)       | (D)                     | 0                           | 0   | (D)                               |
| Textiles and apparel.....                           | 22,23          | 0                                    | 0                 | 0                               | 0         | (D)                     | (D)                         | 0   | 13                                |
| Lumber, wood products, and furniture.....           | 24,25          | 0                                    | 0                 | 0                               | 0         | (D)                     | (D)                         | (D)   | (D)                               |
| Paper and allied products.....                      | 26             | (D)                                  | (D)               | (D)                             | (D)       | 0                       | 0                           | (D)   | (D)                               |
| Chemicals and allied products.....                  | 28             | (D)                                  | (D)               | (D)                             | (D)       | (D)                     | (D)                         | (D)   | (D)                               |
| Industrial chemicals.....                           | 281-82,286     | (D)                                  | (D)               | (D)                             | (D)       | (D)                     | (D)                         | (D)   | (D)                               |
| Drugs and medicines.....                            | 283            | 0                                    | 0                 | 0                               | (D)       | (D)                     | 0                           | (D)   | (D)                               |
| Other chemicals.....                                | 284-85,287-89  | 0                                    | 0                 | 0                               | 5         | (D)                     | 0                           | 0   | (D)                               |
| Petroleum refining and extraction.....              | 13,29          | 0                                    | 0                 | 0                               | 0         | 0                       | 0                           | 0   | (D)                               |
| Rubber products.....                                | 30             | (D)                                  | (D)               | 15                              | (D)       | (D)                     | (D)                         | (D)   | (D)                               |
| Stone, clay, and glass products.....                | 32             | 82                                   | 0                 | 0                               | (D)       | (D)                     | (D)                         | (D)   | (D)                               |
| Primary metals.....                                 | 33             | 0                                    | 161               | 32                              | (D)       | (D)                     | (D)                         | 0   | 7                                 |
| Ferrous metals and products.....                    | 331-32,3398-99 | 0                                    | (D)               | (D)                             | (D)       | (D)                     | (D)                         | 0   | (D)                               |
| Nonferrous metals and products.....                 | 333-36         | 0                                    | (D)               | (D)                             | (D)       | (D)                     | 17 (S)                      | 0   | (D)                               |
| Fabricated metal products.....                      | 34             | (D)                                  | 16                | 108                             | (D)       | (D)                     | (D)                         | (D)   | (D)                               |
| Machinery.....                                      | 35             | (D)                                  | (D)               | 56                              | 4,822     | (D)                     | (D)                         | (D)   | (D)                               |
| Office, computing, and accounting<br>machines ..... | 357            | 0                                    | 0                 | 0                               | (D)       | (D)                     | 0                           | 0   | (D)                               |
| Other machinery, except electrical.....             | 351-56,358-59  | (D)                                  | (D)               | 56                              | (D)       | (D)                     | (D)                         | (D)   | (D)                               |
| Electrical equipment.....                           | 36             | (D)                                  | (D)               | (D)                             | (D)       | (D)                     | (D)                         | 60  | (D)                               |
| Radio and TV receiving equipment.....               | 365            | 0                                    | 0                 | (D)                             | 0         | (D)                     | 0                           | 0   | 0                                 |
| Communication equipment.....                        | 366            | 0                                    | 0                 | 0                               | 0         | (D)                     | (D)                         | (D)   | (D)                               |
| Electronic components.....                          | 367            | 0                                    | (D)               | 0                               | (D)       | (D)                     | (D)                         | (D)   | (D)                               |
| Other electrical equipment.....                     | 361-64,369     | (D)                                  | (D)               | (D)                             | (D)       | 770                     | (D)                         | (D)   | (D)                               |
| Transportation equipment.....                       | 37             | (D)                                  | (D)               | (D)                             | (D)       | (D)                     | (D)                         | (D)   | (D)                               |
| Motor vehicles and motor vehicles<br>equipment..... | 371            | 0                                    | 0                 | (D)                             | (D)       | (D)                     | (D)                         | 0   | (D)                               |

See explanatory information and SOURCE at end of table.

Table A-34. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and product field: 1997

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| Industry   | SIC code                        | Stone, clay<br>and glass<br>products<br>32 | Primary<br>metals<br>33 | Fabricated<br>metal<br>products<br>34 | Machinery<br>35 | Electrical<br>equipment<br>36 | Transportation<br>equipment<br>37 | Professional<br>and scientific<br>instruments<br>38 | Other product<br>fields<br>n.e.c.<br>... |
|--|---------------------------------|--|-------------------------|---------------------------------------|-----------------|-------------------------------|-----------------------------------|---|--|
|  |                                 | [Dollars in millions]                      |                         |                                       |                 |                               |                                   |   |  |
| Distribution by industry:  |                                 |  |                         |                                       |                 |                               |                                   |   |  |
| Other transportation equipment.....  | 373-75,379                      | 0  | 0                       | 0                                     | 0               | 0                             | (D)                               | 0   | 0  |
| Aircraft and missiles.....   | 372,376                         | (D)  | (D)                     | (D)                                   | (D)             | (D)                           | (D)                               | (D)   | (D)                                      |
| Professional and scientific instruments.....                                       | 38                              | 0  | (D)                     | (D)                                   | 84              | (D)                           | (D)                               | 1,788   | 681                                      |
| Scientific and mechanical measuring<br>instruments .....                           | 381-82                          | 0  | 0                       | (D)                                   | (D)             | (D)                           | (D)                               | (D)   | (D)                                      |
| Optical, surgical, photographic, and<br>other instruments.....                     | 384-87                          | 0  | (D)                     | (D)                                   | (D)             | (D)                           | (D)                               | (D)   | (D)                                      |
| Other manufacturing industries <sup>1</sup> .....                                  | 27,31,39                        | 0  | (D)                     | 4                                     | (D)             | (D)                           | 0                                 | 0   | (D)                                      |
| Nonmanufacturing.....  |                                 | (D)  | (D)                     | (D)                                   | (D)             | (D)                           | (D)                               | 111   | (D)                                      |
| Transportation and utilities.....  | 40-42,44-49                     | 0  | (D)                     | 0                                     | (D)             | (D)                           | (D)                               | (D)   | 304                                      |
| Communications.....  | 48                              | 0  | 0                       | 0                                     | 0               | (D)                           | 0                                 | 0   | (D)                                      |
| Telephone communications.....  | 481                             | 0  | 0                       | 0                                     | 0               | (D)                           | 0                                 | 0   | (D)                                      |
| Other communications.....  | 482-484,489                     | 0  | 0                       | 0                                     | 0               | (D)                           | 0                                 | 0   | (D)                                      |
| Electric, gas, and sanitary services.....  | 49                              | 0  | (D)                     | 0                                     | (D)             | (D)                           | (D)                               | (D)   | 113                                      |
| Other transportation and utilities.....  | 40-42,44-47                     | 0  | 0                       | 0                                     | 0               | 0                             | (D)                               | 0   | (D)                                      |
| Trade.....   | 50-59                           | 0  | 0                       | 0                                     | (D)             | (D)                           | (D)                               | (D)   | 430                                      |
| Finance, insurance, and real estate.....   | 60-65,67                        | 0  | 0                       | 0                                     | 0               | (D)                           | 0                                 | 0   | 293                                      |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 0  | (D)                     | (D)                                   | (D)             | (D)                           | (D)                               | 88  | (D)                                      |
| Business services.....   | 73                              | 0  | 0                       | 0                                     | (D)             | (D)                           | (D)                               | (D)   | 4,458                                    |
| Computer and data processing<br>services .....                                     | 737                             | 0  | 0                       | 0                                     | (D)             | (D)                           | (D)                               | (D)   | (D)                                      |
| Other business services.....   | 731-736,738                     | 0  | 0                       | 0                                     | (D)             | (D)                           | 0                                 | (D)   | (D)                                      |
| Health services.....   | 80                              | 0  | 0                       | 0                                     | 0               | 0                             | 0                                 | (D)   | 22                                       |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801, 806,807                    | 0  | 0                       | 0                                     | 0               | 0                             | 0                                 | (D)   | 22                                       |
| Other health services.....   | 802-805,808-809                 | 0  | 0                       | 0                                     | 0               | 0                             | 0                                 | 0   | 0  |

See explanatory information and SOURCE at end of table.

Table A-34. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and product field: 1997

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| Industry   | SIC code                     | Stone, clay<br>and glass<br>products<br>32 | Primary<br>metals<br>33 | Fabricated<br>metal<br>products<br>34 | Machinery<br>35 | Electrical<br>equipment<br>36 | Transportation<br>equipment<br>37 | Professional<br>and scientific<br>instruments<br>38 | Other product<br>fields<br>n.e.c.<br>... |
|--|------------------------------|--|-------------------------|---------------------------------------|-----------------|-------------------------------|-----------------------------------|---|--|
|  |                              | [Dollars in millions]                      |                         |                                       |                 |                               |                                   |   |  |
| <b>Distribution by industry:</b>                                 |                              |  |                         |                                       |                 |                               |                                   |   |  |
| Engineering and management services.....                         | 87                           | 0  | (D)                     | (D)                                   | (D)             | (D)                           | (D)                               | 63  | (D)                                      |
| Engineering, architectural, and<br>surveying .....               | 871                          | 0  | 0                       | (D)                                   | (D)             | (D)                           | (D)                               | (D)   | 195                                      |
| Research, development, and testing.....                          | 873                          | 0  | (D)                     | (D)                                   | (D)             | (D)                           | (D)                               | (D)   | (D)                                      |
| Other engineering and<br>management services                     | 872,874                      | 0  | 0                       | 0                                     | (D)             | 0                             | 0                                 | 0   | 17                                       |
| Other services.....  | 701,72,75-79,81,<br>83,84,89 | 0  | 0                       | 0                                     | (D)             | (D)                           | 0                                 | (D)   | (D)                                      |
| Other nonmanufacturing industries <sup>1</sup> .....             | 07-12,14,15,<br>161-162,17   | (D)  | (D)                     | 0                                     | 20              | 0                             | 0                                 | 0   | (D)                                      |
| <b>Distribution by size of company:</b><br>[Number of employees] |                              |  |                         |                                       |                 |                               |                                   |   |  |
| Total.....   |                              | 117  | 217                     | 455                                   | 7,894           | 14,826                        | 10,295                            | 2,426   | 12,457                                   |
| Fewer than 500.....  |                              | 8  | 16                      | (D)                                   | (D)             | (D)                           | (D)                               | 228   | (D)                                      |
| 500 to 999.....  |                              | 8  | (D)                     | 22                                    | (D)             | (D)                           | (D)                               | 173   | (D)                                      |
| 1,000 to 4,999.....  |                              | 22   | 54                      | 110                                   | 954             | (D)                           | (D)                               | 744   | 3,000                                    |
| 5,000 to 9,999.....  |                              | (D)  | 55                      | (D)                                   | (D)             | (D)                           | (D)                               | (D)   | (D)                                      |
| 10,000 to 24,999.....  |                              | (D)  | 60                      | (D)                                   | (D)             | (D)                           | (D)                               | (D)   | (D)                                      |
| 25,000 or more.....  |                              | (D)  | (D)                     | (D)                                   | (D)             | (D)                           | (D)                               | (D)   | (D)                                      |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

Other product fields n.e.c. = Products not elsewhere classified. Includes Lumber and Wood Products (SIC 24) and Leather (SIC 31) and Software (SIC 737).

**NOTE:** Imputation of R&D expenditures by product field was eliminated beginning in 1985. This table, therefore, contains only data reported by survey respondents who received Form RD-1L.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry and size of company                     | SIC code           | Chemicals   |   |                            |                               |                                   | Primary metals                                   |   | Fabricated metals                             |  | Computer programming, data processing, and other computer related services<br>737 |
|--|--------------------|---|---|----------------------------|-------------------------------|-----------------------------------|--|---|---|--|---|
|  |                    | Industrial inorganic and organic chemicals<br>281,286 | Plastics, synthetic resins, rubber, and fibers<br>282 | Drugs and medicines<br>283 | Agricultural chemicals<br>287 | Other chemicals<br>284-85,<br>289 | Ferrous metals and products<br>331-32<br>3398-99 | Nonferrous metal and products<br>333-36 | Other fabricated metal products<br>341-47,349 | Ordnance and accessories n.e.c.<br>348 |   |
| [Dollars in millions]                            |                    |   |   |                            |                               |                                   |  |   |   |  |   |
| Total.....                                       |                    | 654   | 1,092   | 6,575                      | 562                           | 937                               | 117  | 100                                     | 424   | 31                                     | 6,330   |
| Distribution by industry:                        |                    |   |   |                            |                               |                                   |  |   |   |  |   |
| Manufacturing.....                               |                    | 499   | 1,060   | 5,073                      | 556                           | 917                               | (D)  | (D)                                     | (D)   | (D)                                    | 1,977   |
| Food, kindred, and tobacco products.....         | 20,21              | (D)   | (D)   | (D)                        | (D)                           | 0                                 | 0  | 0                                       | 0   | 0                                      | 0   |
| Textiles and apparel.....                        | 22,23              | 0   | 8   | 0                          | 0                             | 0                                 | 0  | 0                                       | 0   | 0                                      | 0   |
| Lumber, wood products, and furniture.....        | 24,25              | 0   | 0   | 0                          | 0                             | 0                                 | 0  | 0                                       | 0   | 0                                      | 0   |
| Paper and allied products.....                   | 26                 | 10  | (D)   | 0                          | 0                             | (D)                               | 0  | (D)                                     | (D)   | 0                                      | 0   |
| Chemicals and allied products.....               | 28                 | 390   | 704   | 5,066                      | 553                           | 768                               | 0  | (D)                                     | 0   | (D)                                    | (D)   |
| Industrial chemicals.....                        | 281-82,286         | 291   | 687   | (D)                        | 482                           | (D)                               | 0  | (D)                                     | 0   | (D)                                    | 0   |
| Drugs and medicines.....                         | 283                | (D)   | (D)   | 4,483                      | (D)                           | (D)                               | 0  | 0                                       | 0   | 0                                      | 0   |
| Other chemicals.....                             | 284-85,287-89      | (D)   | (D)   | (D)                        | (D)                           | 625                               | 0  | 0                                       | 0   | 0                                      | (D)   |
| Petroleum refining and extraction.....           | 13,29              | (D)   | 125   | 0                          | 0                             | (D)                               | 0  | 0                                       | 0   | 0                                      | 0   |
| Rubber products.....                             | 30                 | (D)   | 65  | (D)                        | 0                             | (D)                               | 0  | (D)                                     | 15  | 0                                      | 0   |
| Stone, clay, and glass products.....             | 32                 | (D)   | (D)   | 0                          | 0                             | (D)                               | 0  | 0                                       | 0   | 0                                      | (D)   |
| Primary metals.....                              | 33                 | (D)   | (D)   | 0                          | 0                             | 0                                 | 101  | 61                                      | 32  | 0                                      | 0   |
| Ferrous metals and products.....                 | 331-32,<br>3398-99 | 0   | (D)   | 0                          | 0                             | 0                                 | (D)  | (D)                                     | (D)   | 0                                      | 0   |
| Nonferrous metals and products.....              | 333-36             | (D)   | (D)   | 0                          | 0                             | 0                                 | (D)  | (D)                                     | (D)   | 0                                      | 0   |
| Fabricated metal products.....                   | 34                 | (D)   | 15  | 0                          | 0                             | (D)                               | 10   | 6                                       | 99  | 9                                      | 0   |
| Machinery.....                                   | 35                 | (D)   | 0   | 0                          | 0                             | (D)                               | (D)  | (D)                                     | 56  | 0                                      | (D)   |
| Office, computing, and accounting machines ..... | 357                | 0   | 0   | 0                          | 0                             | 0                                 | (D)  | (D)                                     | 0   | 0                                      | (D)   |
| Other machinery, except electrical.....          | 351-56,358-59      | (D)   | 0   | 0                          | 0                             | (D)                               | (D)  | (D)                                     | 56  | 0                                      | 5   |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry and size of company                                | SIC code    | Chemicals   |   |                            |                               |                                   | Primary metals                        |  | Fabricated metals                             |  | Computer programming, data processing, and other computer related services<br>737 |
|---|-------------|---|---|----------------------------|-------------------------------|-----------------------------------|---------------------------------------|--|---|--|---|
|   |             | Industrial inorganic and organic chemicals<br>281,286 | Plastics, synthetic resins, rubber, and fibers<br>282 | Drugs and medicines<br>283 | Agricultural chemicals<br>287 | Other chemicals<br>284-85,<br>289 | Ferrous metals and products<br>331-32 | Nonferrous metal and products<br>3398-99 | Other fabricated metal products<br>341-47,349 | Ordnance and accessories n.e.c.<br>348 |   |
|   |             | [Dollars in millions]                                 |   |                            |                               |                                   |                                       |  |   |  |   |
| Distribution by industry:                                   |             |   |   |                            |                               |                                   |                                       |  |   |  |   |
| Electrical equipment.....                                   | 36          | 6   | (D)   | (D)                        | 0                             | (D)                               | (D)                                   | (D)                                      | (D)   | 0                                      | 220   |
| Radio and TV receiving equipment.....                       | 365         | 0   | (D)   | 0                          | 0                             | 0                                 | 0                                     | 0  | (D)   | 0                                      | 0   |
| Communication equipment.....                                | 366         | (D)   | 0   | 0                          | 0                             | 0                                 | 0                                     | 0  | 0   | 0                                      | (D)   |
| Electronic components.....                                  | 367         | 0   | 0   | (D)                        | 0                             | 0                                 | (D)                                   | (D)                                      | 0   | 0                                      | (D)   |
| Other electrical equipment.....                             | 361-64,369  | (D)   | (D)   | 0                          | 0                             | (D)                               | (D)                                   | (D)                                      | (D)   | 0                                      | (D)   |
| Transportation equipment.....                               | 37          | (D)   | (D)   | 0                          | 0                             | (D)                               | (D)                                   | (D)                                      | (D)   | (D)                                    | (D)   |
| Motor vehicles and motor vehicles equipment.....            | 371         | (D)   | (D)   | 0                          | 0                             | (D)                               | 0                                     | 0  | (D)   | (D)                                    | (D)   |
| Other transportation equipment.....                         | 373-75,379  | 0   | 0   | 0                          | 0                             | 0                                 | 0                                     | 0  | 0   | 0                                      | 0   |
| Aircraft and missiles.....                                  | 372,376     | 0   | (D)   | 0                          | 0                             | (D)                               | (D)                                   | (D)                                      | (D)   | (D)                                    | (D)   |
| Professional and scientific instruments.....                | 38          | (D)   | (D)   | (D)                        | 0                             | 0                                 | 0                                     | (D)                                      | (D)   | (D)                                    | 35  |
| Scientific and mechanical measuring instruments .....       | 381-82      | (D)   | (D)   | 0                          | 0                             | 0                                 | 0                                     | 0  | (D)   | (D)                                    | (D)   |
| Optical, surgical, photographic, and other instruments..... | 384-87      | 0   | (D)   | (D)                        | 0                             | 0                                 | 0                                     | (D)                                      | (D)   | 0                                      | (D)   |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39    | 0   | (D)   | 0                          | (D)                           | 0                                 | 0                                     | (D)                                      | 4   | 0                                      | (D)   |
| Nonmanufacturing .....                                      | 155         | 32  | 1,502   | 6                          | 20                            | (D)                               | (D)                                   | (D)                                      | (D)   | (D)                                    | 4,353   |
| Transportation and utilities.....                           | 40-42,44-49 | (D)   | (D)   | 0                          | 0                             | 0                                 | (D)                                   | 0  | 0   | 0                                      | 85  |
| Communications.....   | 48          | 0   | 0   | 0                          | 0                             | 0                                 | 0                                     | 0  | 0   | 0                                      | (D)   |
| Telephone communications.....                               | 481         | 0   | 0   | 0                          | 0                             | 0                                 | 0                                     | 0  | 0   | 0                                      | (D)   |
| Other communications.....                                   | 482-484,489 | 0   | 0   | 0                          | 0                             | 0                                 | 0                                     | 0  | 0   | 0                                      | (D)   |
| Electric, gas, and sanitary services.....                   | 49          | (D)   | (D)   | 0                          | 0                             | 0                                 | (D)                                   | 0  | 0   | 0                                      | 0   |
| Other transportation and utilities.....                     | 40-42,44-47 | (D)   | (D)   | 0                          | 0                             | 0                                 | 0                                     | 0  | 0   | 0                                      | (D)   |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry and size of company  | SIC code                        | Chemicals   |   |                            |                               |                                   | Primary metals                                   |   | Fabricated metals                             |  | Computer programming, data processing, and other computer related services<br>737 |
|---|---------------------------------|---|---|----------------------------|-------------------------------|-----------------------------------|--|---|---|--|---|
|   |                                 | Industrial inorganic and organic chemicals<br>281,286 | Plastics, synthetic resins, rubber, and fibers<br>282 | Drugs and medicines<br>283 | Agricultural chemicals<br>287 | Other chemicals<br>284-85,<br>289 | Ferrous metals and products<br>331-32<br>3398-99 | Nonferrous metal and products<br>333-36 | Other fabricated metal products<br>341-47,349 | Ordnance and accessories n.e.c.<br>348 |   |
| [Dollars in millions]   |                                 |   |   |                            |                               |                                   |  |   |   |  |   |
| Distribution by industry:   |                                 |   |   |                            |                               |                                   |  |   |   |  |   |
| Trade.....  | 50-59                           | (D)   | (D)   | 174                        | 1                             | (D)                               | 0  | 0                                       | 0   | 0                                      | (D)   |
| Finance, insurance, and real estate.....  | 60-65,67                        | 0   | 1   | 0                          | 0                             | 0                                 | 0  | 0                                       | 0   | 0                                      | 278   |
| Services.....   | 701,72,73,75-<br>81,83,84,87,89 | (D)   | (D)   | 1,327                      | (D)                           | (D)                               | 0  | (D)                                     | (D)   | (D)                                    | 3,914   |
| Business services.....  | 73                              | (D)   | 0   | 0                          | 0                             | 0                                 | 0  | 0                                       | 0   | 0                                      | 3,802   |
| Computer and data processing services .....                                     | 737                             | (D)   | 0   | 0                          | 0                             | 0                                 | 0  | 0                                       | 0   | 0                                      | 3,778   |
| Other business services.....  | 731-736,738                     | 0   | 0   | 0                          | 0                             | 0                                 | 0  | 0                                       | 0   | 0                                      | 24  |
| Health services.....  | 80                              | 0   | 0   | (D)                        | (D)                           | 0                                 | 0  | 0                                       | 0   | 0                                      | 0   |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | 0   | 0   | (D)                        | (D)                           | 0                                 | 0  | 0                                       | 0   | 0                                      | 0   |
| Other health services.....  | 802-805,<br>808-809             | 0   | 0   | (D)                        | (D)                           | 0                                 | 0  | 0                                       | 0   | 0                                      | 0   |
| Engineering and management services .....                                       | 87                              | 9   | (D)   | 1,290                      | (D)                           | (D)                               | 0  | (D)                                     | (D)   | (D)                                    | 103   |
| Engineering, architectural, and surveying .....                                 | 871                             | 0   | 0   | (D)                        | 0                             | 0                                 | 0  | (D)                                     | (D)   | (D)                                    | 49  |
| Research, development, and testing .....  | 873                             | 9   | (D)   | (D)                        | (D)                           | (D)                               | 0  | (D)                                     | 0   | (D)                                    | 37  |
| Other engineering and management services.....                                  | 872,874                         | 0   | 0   | (D)                        | 0                             | 0                                 | 0  | 0                                       | 0   | 0                                      | 17  |
| Other services.....   | 701,72,75-79,<br>81,83,84,89    | 0   | 0   | 0                          | 0                             | 0                                 | 0  | 0                                       | 0   | 0                                      | 10  |
| Other nonmanufacturing industries <sup>1</sup> .....                            | 07-12,14,15,<br>161-162,17      | (D)   | 0   | 0                          | 0                             | (D)                               | 0  | (D)                                     | 0   | 0                                      | (D)   |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry and size of company                              | SIC code | Chemicals   |   |                            |                               |   | Primary metals                        |   | Fabricated metals                             |  | Computer programming, data processing, and other computer related services<br>737 |
|---|----------|---|---|----------------------------|-------------------------------|---|---------------------------------------|---|---|--|---|
|   |          | Industrial inorganic and organic chemicals<br>281,286 | Plastics, synthetic resins, rubber, and fibers<br>282 | Drugs and medicines<br>283 | Agricultural chemicals<br>287 | Other chemicals<br>284-85,<br>331-32<br>3398-99 | Ferrous metals and products<br>331-32 | Nonferrous metal and products<br>333-36 | Other fabricated metal products<br>341-47,349 | Ordnance and accessories n.e.c.<br>348 |   |
| [Dollars in millions]                                     |          |   |   |                            |                               |   |                                       |   |   |  |   |
| Distribution by size of company:<br>[Number of employees] |          |   |   |                            |                               |   |                                       |   |   |  |   |
| Total.....  |          | 654   | 1,092   | 6,575                      | 562                           | 937   | 117                                   | 100                                     | 424   | 31                                     | 6,330   |
| Fewer than 500.....                                       |          | (D)   | (D)   | 1,219                      | (D)                           | 5   | (D)                                   | (D)                                     | (D)   | (D)                                    | 786   |
| 500 to 999.....   |          | 28  | 13  | 186                        | 1                             | 12  | 0                                     | (D)                                     | 15  | 7                                      | 382   |
| 1,000 to 4,999.....                                       |          | 310   | (D)   | 1,966                      | (D)                           | 148   | 21                                    | 32                                      | 92  | 18                                     | 1,936   |
| 5,000 to 9,999.....                                       |          | 109   | (D)   | 1,307                      | (D)                           | 289   | 24                                    | 31                                      | 47  | (D)                                    | 408   |
| 10,000 to 24,999.....                                     |          | 115   | 319   | (D)                        | (D)                           | (D)   | 44                                    | 15                                      | (D)   | (D)                                    | 855   |
| 25,000 or more.....                                       |          | (D)   | (D)   | (D)                        | (D)                           | (D)   | (D)                                   | (D)                                     | (D)   | 0                                      | 1,963   |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry  | SIC code           | Machinery                   |                                     |  |  |   |   | Electrical equipment                                    |  |   |                                 |
|---|--------------------|-----------------------------|-------------------------------------|--|--|---|---|---|--|---|---------------------------------|
|   |                    | Engines and turbines<br>351 | Farm machinery and equipment<br>352 | Construction mining, and materials handling machinery<br>353 | Metal-working machinery and equipment<br>354 | Office computing and accounting machines<br>357 | Other machinery except electrical<br>355-56 | Electric transmission and distribution equipment<br>361 | Electrical industrial apparatus<br>362 | Radio and television receiving sets except communication types<br>365 | Communications equipment<br>366 |
|   |                    | [Dollars in millions]       |                                     |  |  |   |   |   |  |   |                                 |
| All Industries.....                             |                    | 1,538                       | 320                                 | 420  | 128  | 4,835   | 651   | 223   | 253                                    | 219   | 5,569                           |
| Distribution by industry:                       |                    |                             |                                     |  |  |   |   |   |  |   |                                 |
| Manufacturing.....                              |                    | 1,531                       | (D)                                 | 397  | (D)  | 3,524   | 645   | (D)   | (D)                                    | 219   | 4,912                           |
| Food, kindred, and tobacco products.....        | 20,21              | 0                           | 0                                   | 0  | 0  | 0   | (D)   | 0   | (D)                                    | 0   | 0                               |
| Textiles and apparel.....                       | 22,23              | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | 0                               |
| Lumber, wood products, and furniture.....       | 24,25              | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | (D)                                    | 0   | 0                               |
| Paper and allied products.....                  | 26                 | 0                           | 0                                   | 0  | 0  | (D)   | 0   | 0   | 0                                      | 0   | 0                               |
| Chemicals and allied products.....              | 28                 | 0                           | 0                                   | 5  | 0  | (D)   | (D)   | 0   | (D)                                    | 0   | 0                               |
| Industrial chemicals.....                       | 281-82,286         | 0                           | 0                                   | 0  | 0  | 0   | (D)   | 0   | 0                                      | 0   | 0                               |
| Drugs and medicines.....                        | 283                | 0                           | 0                                   | 0  | 0  | (D)   | 0   | 0   | (D)                                    | 0   | 0                               |
| Other chemicals.....                            | 284-85,287-89      | 0                           | 0                                   | 5  | 0  | 0   | 0   | 0   | 0                                      | 0   | 0                               |
| Petroleum refining and extraction.....          | 13,29              | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | 0                               |
| Rubber products.....                            | 30                 | 0                           | 0                                   | 0  | 0  | 0   | (D)   | 0   | 0                                      | 0   | 0                               |
| Stone, clay, and glass products.....            | 32                 | 0                           | 0                                   | (D)  | 0  | 0   | 0   | 0   | 0                                      | 0   | (D)                             |
| Primary metals.....                             | 33                 | 0                           | (D)                                 | (D)  | 0  | 0   | (D)   | (D)   | (D)                                    | 0   | (D)                             |
| Ferrous metals and products.....                | 331-32,<br>3398-99 | 0                           | (D)                                 | (D)  | 0  | 0   | (D)   | 0   | (D)                                    | 0   | 0                               |
| Nonferrous metals and products.....             | 333-36             | 0                           | (D)                                 | (D)  | 0  | 0   | 0   | (D)   | 0                                      | 0   | (D)                             |
| Fabricated metal products.....                  | 34                 | 0                           | (D)                                 | (D)  | 13   | (D)   | 24  | 0   | 0                                      | 0   | (D)                             |
| Machinery.....                                  | 35                 | 381                         | 309                                 | 379  | 111  | 3,176   | 466   | (D)   | (D)                                    | (D)   | (D)                             |
| Office, computing, and accounting machines..... | 357                | 0                           | 0                                   | 0  | 0  | (D)   | (D)   | 0   | 0                                      | 0   | (D)                             |
| Other machinery, except electrical.....         | 351-56,358-59      | 381                         | 309                                 | 379  | 111  | (D)   | (D)   | (D)   | (D)                                    | (D)   | (D)                             |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry  | SIC code    | Machinery                   |                                     |  |  |   |   | Electrical equipment                                    |  |   |       |
|---|-------------|-----------------------------|-------------------------------------|--|--|---|---|---|--|---|-------|
|   |             | Engines and turbines<br>351 | Farm machinery and equipment<br>352 | Construction mining, and materials handling machinery<br>353 | Metal-working machinery and equipment<br>354 | Office computing and accounting machines<br>357 | Other machinery except electrical<br>355-56 | Electric transmission and distribution equipment<br>361 | Electrical industrial apparatus<br>362 | Radio and television receiving sets except communication types<br>365 |       |
|   |             | [Dollars in millions]       |                                     |  |  |   |   |   |  |   |       |
| Distribution by industry:                                   |             |                             |                                     |  |  |   |   |   |  |   |       |
| Electrical equipment.....                                   | 36          | (D)                         | 0                                   | 0  | 0  | (D)   | (D)   | 180   | (D)                                    | (D)   | 3,894 |
| Radio and TV receiving equipment.....                       | 365         | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | (D)                                    | (D)   | 0     |
| Communication equipment.....                                | 366         | 0                           | 0                                   | 0  | 0  | 0   | 0   | (D)   | 0                                      | (D)   | 3,749 |
| Electronic components.....                                  | 367         | (D)                         | 0                                   | 0  | 0  | (D)   | 0   | (D)   | (D)                                    | (D)   | 104   |
| Other electrical equipment.....                             | 361-64,369  | (D)                         | 0                                   | 0  | 0  | 0   | (D)   | 156   | 110                                    | 0   | 41    |
| Transportation equipment.....                               | 37          | (D)                         | 0                                   | 0  | (D)  | (D)   | 11  | (D)   | (D)                                    | 0   | (D)   |
| Motor vehicles and motor vehicles equipment.....            | 371         | (D)                         | 0                                   | 0  | 0  | 0   | (D)   | 0   | 0                                      | 0   | 0     |
| Other transportation equipment.....                         | 373-75,379  | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | 0     |
| Aircraft and missiles.....                                  | 372,376     | (D)                         | 0                                   | 0  | (D)  | (D)   | (D)   | (D)   | (D)                                    | 0   | (D)   |
| Professional and scientific instruments.....                | 38          | 0                           | 0                                   | 0  | 0  | 0   | 84  | (D)   | 44                                     | (D)   | 93    |
| Scientific and mechanical measuring instruments.....        | 381-82      | 0                           | 0                                   | 0  | 0  | 0   | (D)   | 4   | (D)                                    | (D)   | 93    |
| Optical, surgical, photographic, and other instruments..... | 384-87      | 0                           | 0                                   | 0  | 0  | 0   | (D)   | (D)   | (D)                                    | 0   | 0     |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39    | 0                           | 0                                   | 0  | (D)  | (D)   | (D)   | 0   | (D)                                    | 0   | (D)   |
| Nonmanufacturing.....                                       | 7           | (D)                         | 23                                  | (D)  | 1,311  | 7   | (D)   | (D)   | (D)                                    | 0   | 657   |
| Transportation and utilities.....                           | 40-42,44-49 | (D)                         | 0                                   | (D)  | (D)  | (D)   | (D)   | (D)   | (D)                                    | 0   | 324   |
| Communications.....   | 48          | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | 324   |
| Telephone communications.....                               | 481         | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | (D)   |
| Other communications.....                                   | 482-484,489 | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | (D)   |
| Electric, gas, and sanitary services.....                   | 49          | (D)                         | 0                                   | (D)  | (D)  | (D)   | (D)   | (D)   | (D)                                    | 0   | 0     |
| Other transportation and utilities.....                     | 40-42,44-47 | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | 0     |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry  | SIC code                        | Machinery                   |                                     |  |  |   |   | Electrical equipment                                    |  |   |                                 |
|---|---------------------------------|-----------------------------|-------------------------------------|--|--|---|---|---|--|---|---------------------------------|
|   |                                 | Engines and turbines<br>351 | Farm machinery and equipment<br>352 | Construction mining, and materials handling machinery<br>353 | Metal-working machinery and equipment<br>354 | Office computing and accounting machines<br>357 | Other machinery except electrical<br>355-56 | Electric transmission and distribution equipment<br>361 | Electrical industrial apparatus<br>362 | Radio and television receiving sets except communication types<br>365 | Communications equipment<br>366 |
|   |                                 | [Dollars in millions]       |                                     |  |  |   |   |   |  |   |                                 |
| Distribution by industry:   |                                 |                             |                                     |  |  |   |   |   |  |   |                                 |
| Trade.....  | 50-59                           | (D)                         | (D)                                 | 0  | 0  | (D)   | 0   | 0   | 0                                      | 0   | (D)                             |
| Finance, insurance, and real estate.....  | 60-65,67                        | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | (D)                             |
| Services.....   | 701,72,73,75-<br>81,83,84,87,89 | 7                           | (D)                                 | (D)  | 2  | 132   | (D)   | (D)   | 0                                      | 0   | 100                             |
| Business services.....  | 73                              | 0                           | 0                                   | 0  | (D)  | (D)   | 0   | (D)   | 0                                      | 0   | 38                              |
| Computer and data processing services .....                                     | 737                             | 0                           | 0                                   | 0  | (D)  | (D)   | 0   | 0   | 0                                      | 0   | (D)                             |
| Other business services.....  | 731-736,738                     | 0                           | 0                                   | 0  | (D)  | (D)   | 0   | (D)   | 0                                      | 0   | (D)                             |
| Health services.....  | 80                              | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | 0                               |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | 0                               |
| Other health services.....  | 802-805,<br>808-809             | 0                           | 0                                   | 0  | 0  | 0   | 0   | 0   | 0                                      | 0   | 0                               |
| Engineering and management services .....                                       | 87                              | 7                           | (D)                                 | (D)  | (D)  | 50  | (D)   | (D)   | 0                                      | 0   | 62                              |
| Engineering, architectural, and surveying .....                                 | 871                             | (D)                         | (D)                                 | (D)  | (D)  | (D)   | (D)   | (D)   | 0                                      | 0   | 30                              |
| Research, development, and testing.....   | 873                             | (D)                         | 0                                   | 0  | 0  | (D)   | (D)   | 0   | 0                                      | 0   | 32                              |
| Other engineering and management services.....                                  | 872,874                         | 0                           | 0                                   | 0  | 0  | (D)   | (D)   | 0   | 0                                      | 0   | 0                               |
| Other services.....   | 701,72,75-79,<br>81,83,84,89    | 0                           | 0                                   | 0  | 0  | (D)   | (D)   | 0   | 0                                      | 0   | 0                               |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry  | SIC code                   | Machinery                   |                                     |  |  |   |   | Electrical equipment                                    |  |   | Communications equipment<br>366 |
|---|----------------------------|-----------------------------|-------------------------------------|--|--|---|---|---|--|---|---------------------------------|
|   |                            | Engines and turbines<br>351 | Farm machinery and equipment<br>352 | Construction mining, and materials handling machinery<br>353 | Metal-working machinery and equipment<br>354 | Office computing and accounting machines<br>357 | Other machinery except electrical<br>355-56 | Electric transmission and distribution equipment<br>361 | Electrical industrial apparatus<br>362 | Radio and television receiving sets except communication types<br>365 |                                 |
|   |                            | [Dollars in millions]       |                                     |  |  |   |   |   |  |   |                                 |
| Distribution by industry:                                 |                            |                             |                                     |  |  |   |   |   |  |   |                                 |
| Other nonmanufacturing industries <sup>1</sup> .....      | 07-12,14,15,<br>161-162,17 | 0                           | 0                                   | 20   | 0  | 0   | 0   | 0   | 0                                      | 0   | 0                               |
| Distribution by size of company:<br>[Number of employees] |                            |                             |                                     |  |  |   |   |   |  |   |                                 |
| Total.....  |                            | 1,538                       | 320                                 | 420  | 128  | 4,835   | 651   | 223   | 253                                    | 219   | 5,569                           |
| Fewer than 500.....                                       |                            | 5                           | (D)                                 | (D)  | 17   | 99  | 38  | (D)   | (D)                                    | 10  | 243                             |
| 500 to 999.....   |                            | (D)                         | (D)                                 | 25   | 21   | 36  | 157   | (D)   | (D)                                    | (D)   | (D)                             |
| 1,000 to 4,999.....                                       |                            | 14                          | 69                                  | 70   | 61   | 442   | 298   | 47  | (D)                                    | (D)   | 669                             |
| 5,000 to 9,999.....                                       |                            | 64                          | (D)                                 | 39   | (D)  | 893   | (D)   | (D)   | 7                                      | (D)   | 752                             |
| 10,000 to 24,999.....                                     |                            | (D)                         | (D)                                 | (D)  | (D)  | (D)   | 124   | 129   | 29                                     | (D)   | (D)                             |
| 25,000 or more.....                                       |                            | 1,368                       | (D)                                 | (D)  | 0  | (D)   | (D)   | (D)   | 116                                    | (D)   | 3,639                           |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry   | SIC code       | Electrical equipment                  |  | Transportation equipment     |                                |                    | Professional and scientific instruments |   |     |
|--|----------------|---------------------------------------|--|------------------------------|--------------------------------|--------------------|---|---|-----|
|  |                | Electronic components and accessories | Other electrical equipment and supplies<br>363-64,<br>368-69 | Motor vehicles and equipment | Other transportation equipment | Aircraft and parts | Guided missiles and spacecraft          | Scientific and mechanical measuring instruments |     |
|  |                | 367                                   | 371  | 379                          | 372                            | 376                | 381-82                                  | 383-87  |     |
| [Dollars in millions]                            |                |                                       |  |                              |                                |                    |   |   |     |
| All Industries.....                              |                | 7,763                                 | 798  | 7,901                        | 135                            | 1,551              | 708                                     | 1,491   | 935 |
| Distribution by industry:                        |                |                                       |  |                              |                                |                    |   |   |     |
| Manufacturing.....                               |                | 7,527                                 | 778  | 7,509                        | (D)                            | 1,536              | (D)                                     | 1,451   | 864 |
| Food, kindred, and tobacco products.....         | 20,21          | 0                                     | 0  | 0                            | 0                              | 0                  | 0                                       | 0   | 0   |
| Textiles and apparel.....                        | 22,23          | 0                                     | (D)  | (D)                          | 0                              | 0                  | 0                                       | 0   | 0   |
| Lumber, wood products, and furniture.....        | 24,25          | (D)                                   | 0  | (D)                          | 0                              | (D)                | 0                                       | (D)   | 0   |
| Paper and allied products.....                   | 26             | 0                                     | 0  | 0                            | 0                              | 0                  | 0                                       | (D)   | (D) |
| Chemicals and allied products.....               | 28             | 117                                   | (D)  | (D)                          | 0                              | 0                  | 0                                       | (D)   | (D) |
| Industrial chemicals.....                        | 281-82,286     | (D)                                   | (D)  | (D)                          | 0                              | 0                  | 0                                       | 0   | (D) |
| Drugs and medicines.....                         | 283            | 0                                     | (D)  | 0                            | 0                              | 0                  | 0                                       | (D)   | 315 |
| Other chemicals.....                             | 284-85,287-89  | (D)                                   | 0  | 0                            | 0                              | 0                  | 0                                       | (D)   | 0   |
| Petroleum refining and extraction.....           | 13,29          | 0                                     | 0  | 0                            | 0                              | 0                  | 0                                       | 0   | 0   |
| Rubber products.....                             | 30             | (D)                                   | (D)  | 13                           | (D)                            | (D)                | 0                                       | (D)   | 0   |
| Stone, clay, and glass products.....             | 32             | (D)                                   | 0  | 40                           | (D)                            | (D)                | 0                                       | (D)   | 0   |
| Primary metals.....                              | 33             | (D)                                   | (D)  | 19                           | (D)                            | (D)                | 0                                       | 0   | 0   |
| Ferrous metals and products.....                 | 331-32,3398-99 | (D)                                   | (D)  | (D)                          | 0                              | (D)                | 0                                       | 0   | 0   |
| Nonferrous metals and products.....              | 333-36         | (D)                                   | 0  | (D)                          | 0                              | 0                  | 0                                       | 0   | 0   |
| Fabricated metal products.....                   | 34             | (D)                                   | (D)  | 5                            | (D)                            | (D)                | (D)                                     | (D)   | 0   |
| Machinery.....                                   | 35             | 1,262                                 | 250  | 149                          | (D)                            | (D)                | 0                                       | (D)   | (D) |
| Office, computing, and accounting machines ..... | 357            | 1,221                                 | (D)  | 0                            | 0                              | 0                  | 0                                       | 0   | 0   |
| Other machinery, except electrical.....          | 351-56,358-59  | 40                                    | (D)  | 149                          | (D)                            | (D)                | 0                                       | (D)   | (D) |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry  | SIC code    | Electrical equipment                  |   | Transportation equipment     |                                |                    |                                | Professional and scientific instruments         |  |  |
|---|-------------|---------------------------------------|---|------------------------------|--------------------------------|--------------------|--------------------------------|---|--|--|
|   |             | Electronic components and accessories | Other electrical equipment and supplies | Motor vehicles and equipment | Other transportation equipment | Aircraft and parts | Guided missiles and spacecraft | Scientific and mechanical measuring instruments | Optical, surgical photographic and other instruments |  |
|   |             | 367                                   | 363-64,<br>368-69                       | 371                          | 379                            | 372                | 376                            | 381-82  | 383-87   |  |
| [Dollars in millions]                                       |             |                                       |   |                              |                                |                    |                                |   |  |  |
| Distribution by industry:                                   |             |                                       |   |                              |                                |                    |                                |   |  |  |
| Electrical equipment.....                                   | 36          | 3,228                                 | 336                                     | 25                           | 10                             | (D)                | (D)                            | 37  | 24   |  |
| Radio and TV receiving equipment.....                       | 365         | (D)                                   | 0                                       | 0                            | 0                              | 0                  | 0                              | (D)   | 0  |  |
| Communication equipment.....                                | 366         | (D)                                   | (D)                                     | 0                            | (D)                            | 0                  | 0                              | (D)   | 0  |  |
| Electronic components.....                                  | 367         | 2,625                                 | (D)                                     | (D)                          | 0                              | 0                  | 0                              | (D)   | (D)  |  |
| Other electrical equipment.....                             | 361-64,369  | 198                                   | 265                                     | (D)                          | (D)                            | (D)                | (D)                            | (D)   | (D)  |  |
| Transportation equipment.....                               | 37          | (D)                                   | 0                                       | (D)                          | 27                             | (D)                | (D)                            | (D)   | 0  |  |
| Motor vehicles and motor vehicles equipment .....           | 371         | (D)                                   | 0                                       | (D)                          | 0                              | 0                  | (D)                            | 0   | 0  |  |
| Other transportation equipment.....                         | 373-75,379  | 0                                     | 0                                       | (D)                          | (D)                            | 0                  | 0                              | 0   | 0  |  |
| Aircraft and missiles.....                                  | 372,376     | (D)                                   | 0                                       | (D)                          | (D)                            | (D)                | 123                            | (D)   | 0  |  |
| Professional and scientific instruments.....                | 38          | 2,370                                 | 126                                     | (D)                          | (D)                            | (D)                | (D)                            | 1,270   | 517  |  |
| Scientific and mechanical measuring instruments .....       | 381-82      | (D)                                   | 113                                     | (D)                          | (D)                            | 14                 | (D)                            | (D)   | (D)  |  |
| Optical, surgical, photographic, and other instruments..... | 384-87      | (D)                                   | 13                                      | 0                            | 0                              | (D)                | 0                              | (D)   | (D)  |  |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39    | 11 (S)                                | 9                                       | 0                            | 0                              | 0                  | 0                              | 0   | 0  |  |
| Nonmanufacturing.....                                       |             | 236                                   | 21                                      | 393                          | (D)                            | 15                 | 89                             | 39  | 72   |  |
| Transportation and utilities.....                           | 40-42,44-49 | (D)                                   | (D)                                     | (D)                          | (D)                            | (D)                | 0                              | (D)   | (D)  |  |
| Communications.....   | 48          | 0                                     | 0                                       | 0                            | 0                              | 0                  | 0                              | 0   | 0  |  |
| Telephone communications.....                               | 481         | 0                                     | 0                                       | 0                            | 0                              | 0                  | 0                              | 0   | 0  |  |
| Other communications.....                                   | 482-484,489 | 0                                     | 0                                       | 0                            | 0                              | 0                  | 0                              | 0   | 0  |  |
| Electric, gas, and sanitary services.....                   | 49          | (D)                                   | (D)                                     | 0                            | (D)                            | (D)                | 0                              | (D)   | (D)  |  |
| Other transportation and utilities.....                     | 40-42,44-47 | 0                                     | 0                                       | (D)                          | (D)                            | (D)                | 0                              | 0   | 0  |  |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry  | SIC code                        | Electrical equipment                  |   | Transportation equipment     |                                |                    | Professional and scientific instruments |   |  |
|---|---------------------------------|---------------------------------------|---|------------------------------|--------------------------------|--------------------|---|---|--|
|   |                                 | Electronic components and accessories | Other electrical equipment and supplies | Motor vehicles and equipment | Other transportation equipment | Aircraft and parts | Guided missiles and spacecraft          | Scientific and mechanical measuring instruments |  |
|   |                                 | 367                                   | 363-64,<br>368-69                       | 371                          | 379                            | 372                | 376                                     | 381-82  |  |
| [Dollars in millions]   |                                 |                                       |   |                              |                                |                    |   |   |  |
| Distribution by industry:   |                                 |                                       |   |                              |                                |                    |   |   |  |
| Trade.....  | 50-59                           | (D)                                   | 0                                       | 0                            | (D)                            | (D)                | 0                                       | (D)   |  |
| Finance, insurance, and real estate.....  | 60-65,67                        | 0                                     | 0                                       | 0                            | 0                              | 0                  | 0                                       | 0   |  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | 127                                   | (D)                                     | 391                          | (D)                            | (D)                | 89                                      | 29  |  |
| Business services.....  | 73                              | (D)                                   | (D)                                     | 0                            | 0                              | (D)                | 0                                       | (D)   |  |
| Computer and data processing services .....                                     | 737                             | 36                                    | (D)                                     | 0                            | 0                              | (D)                | 0                                       | (D)   |  |
| Other business services.....  | 731-736 738                     | (D)                                   | (D)                                     | 0                            | 0                              | 0                  | 0                                       | (D)   |  |
| Health services.....  | 80                              | 0                                     | 0                                       | 0                            | 0                              | 0                  | 0                                       | (D)   |  |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | 0                                     | 0                                       | 0                            | 0                              | 0                  | 0                                       | (D)   |  |
| Other health services.....  | 802-805,<br>808-809             | 0                                     | 0                                       | 0                            | 0                              | 0                  | 0                                       | 0   |  |
| Engineering and management services.....  | 87                              | 70                                    | (D)                                     | 391                          | (D)                            | 14                 | (D)                                     | 28  |  |
| Engineering, architectural, and surveying .....                                 | 871                             | (D)                                   | (D)                                     | 21                           | (D)                            | (D)                | (D)                                     | (D)   |  |
| Research, development, and testing.....   | 873                             | (D)                                   | (D)                                     | 370                          | (D)                            | (D)                | (D)                                     | (D)   |  |
| Other engineering and management services .....                                 | 872,874                         | 0                                     | 0                                       | 0                            | (D)                            | 0                  | 0                                       | 0   |  |
| Other services.....   | 701,72,75-79,81,                | (D)                                   | (D)                                     | 0                            | 0                              | (D)                | 0                                       | (D)   |  |

See explanatory information and SOURCE at end of table.

Table A-35. Total (company, Federal, and other) funds for industrial applied R&amp;D performance, by industry, size of company, and detailed product field: 1997

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| Industry  | SIC code                   | Electrical equipment                  |   | Transportation equipment     |                                |                    | Professional and scientific instruments |   |  |
|---|----------------------------|---------------------------------------|---|------------------------------|--------------------------------|--------------------|---|---|--|
|   |                            | Electronic components and accessories | Other electrical equipment and supplies | Motor vehicles and equipment | Other transportation equipment | Aircraft and parts | Guided missiles and spacecraft          | Scientific and mechanical measuring instruments |  |
|   |                            | 367                                   | 363-64,<br>368-69                       | 371                          | 379                            | 372                | 376                                     | 381-82  |  |
| [Dollars in millions]                                     |                            |                                       |   |                              |                                |                    |   |   |  |
| Distribution by industry:                                 |                            |                                       |   |                              |                                |                    |   |   |  |
| Other nonmanufacturing industries <sup>1</sup> .....      | 07-12,14,15,<br>161-162,17 | (D)                                   | 0                                       | (D)                          | 0                              | (D)                | 0                                       | 0   |  |
| Distribution by size of company:<br>[Number of employees] |                            |                                       |   |                              |                                |                    |   |   |  |
| Total.....  |                            | 7,763                                 | 798                                     | 7,901                        | 135                            | 1,551              | 708                                     | 1,491   |  |
| Fewer than 500.....                                       |                            | 276                                   | 42                                      | 181                          | (D)                            | (D)                | 21                                      | 98  |  |
| 500 to 999.....   |                            | 264                                   | 48                                      | 254                          | 36                             | (D)                | (D)                                     | 107   |  |
| 1,000 to 4,999.....                                       |                            | 1,892                                 | 95                                      | 260                          | (D)                            | 157                | (D)                                     | 397   |  |
| 5,000 to 9,999.....                                       |                            | 1,215                                 | 55                                      | (D)                          | (D)                            | 13                 | (D)                                     | (D)   |  |
| 10,000 to 24,999.....                                     |                            | 483                                   | 242                                     | 387                          | (D)                            | (D)                | (D)                                     | (D)   |  |
| 25,000 or more.....                                       |                            | 3,634                                 | 317                                     | (D)                          | 11                             | (D)                | (D)                                     | (D)   |  |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

**NOTE:** Imputation of R&D expenditures by product field was eliminated beginning in 1985. This table, therefore, contains only data reported by survey respondents who received Form RD-1L. See Table A-34 for coverage ratios showing the percentage of each industry's applied research and development funds that respondents distributed by product field.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-36. Total (company, Federal, and other) funds for industrial energy R&amp;D performance, by industry and size of company: 1987-97 and projected 1998

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| Industry and size of company                       | SIC code       | 1987                  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995  | 1996 <sup>1</sup> | 1997  | Projected<br>1998 |  |
|--|----------------|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|-------|-------------------|--|
|  |                | [Dollars in millions] |       |       |       |       |       |       |       |       |                   |       |                   |  |
| All Industries.....                                |                | 3,576                 | 3,706 | 3,789 | 4,004 | 4,615 | 3,225 | 2,747 | 2,549 | 2,330 | 2,184             | 1,640 | 1,375             |  |
| Distribution by industry:                          |                |                       |       |       |       |       |       |       |       |       |                   |       |                   |  |
| Manufacturing.....                                 |                | 3,143                 | 3,155 | 3,175 | 3,274 | 3,918 | 2,631 | 2,111 | 1,740 | 1,797 | 1,763             | 1,269 | 1,033             |  |
| Food, kindred, and tobacco products.....           | 20,21          | (S)                   | (3)   | (D)   | (D)   | (D)   | 0     | (D)   | (D)   | 0     | (D)               | 0     | 0                 |  |
| Textiles and apparel.....                          | 22,23          | (D)                   | (D)   | (D)   | (D)   | 0     | 0     | 0     | 0     | 0     | 0                 | 0     | 0                 |  |
| Lumber, wood products, and furniture.....          | 24,25          | (D)                   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)               | 0     | 0                 |  |
| Paper and allied products.....                     | 26             | 1                     | 1     | (D)   | (D)   | (D)   | 1     | (D)   | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Chemicals and allied products.....                 | 28             | (S)                   | (S)   | 111   | 417   | (D)   | 72    | (D)   | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Industrial chemicals.....                          | 281-82,286     | (D)                   | (D)   | 108   | 414   | (D)   | 66    | (D)   | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Drugs and medicines.....                           | 283            | (D)                   | (D)   | (D)   | (D)   | (D)   | 0     | 0     | 0     | 0     | 0                 | 0     | 0                 |  |
| Other chemicals.....                               | 284-85,287-89  | 2                     | 4     | (D)   | (D)   | (D)   | 0     | (D)   | 2     | 2     | 2                 | 6     | 7                 |  |
| Petroleum refining and extraction.....             | 13,29          | 914                   | 1,056 | 1,128 | 1,177 | 1,416 | 1,150 | 798   | (D)   | (D)   | (D)               | 387   | 413               |  |
| Rubber products.....                               | 30             | (D)                   | (D)   | (D)   | (D)   | (D)   | (D)   | 2     | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Stone, clay, and glass products.....               | 32             | 1                     | (D)   | 1     | (D)               | (D)   | (D)               |  |
| Primary metals.....                                | 33             | 18                    | 21    | (D)   | (D)   | 26    | 3     | 17    | 68    | (D)   | (D)               | (D)   | (D)               |  |
| Ferrous metals and products.....                   | 331-32,3398-99 | (D)                   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Nonferrous metals and products.....                | 333-36         | (D)                   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Fabricated metal products.....                     | 34             | (D)                   | (D)   | 14    | 49    | 2     | (D)   | (D)   | 1     | (D)   | (D)               | (D)   | (D)               |  |
| Machinery.....                                     | 35             | (D)                   | 244   | 260   | 254   | (S)   | 154   | (D)   | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Office, computing, and accounting<br>machines..... | 357            | (D)                   | (D)   | (D)   | 0     | (D)   | (D)   | 0     | 0     | 0     | 0                 | 0     | 0                 |  |
| Other machinery, except electrical.....            | 351-56,358-59  | (D)                   | (D)   | (D)   | 235   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Electrical equipment.....                          | 36             | 578                   | 680   | 647   | 627   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)               | (D)   | (D)               |  |
| Radio and TV receiving equipment.....              | 365            | 0                     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0                 | 0     | 0                 |  |
| Communication equipment.....                       | 366            | (D)                   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)   | 12    | (D)   | (D)               | (D)   | (D)               |  |
| Electronic components.....                         | 367            | (D)                   | (D)   | (D)   | (D)   | (D)   | 8     | 14    | (D)   | (D)   | (D)               | (D)   | 0                 |  |
| Other electrical equipment.....                    | 361-64,369     | (S)                   | (D)               | (D)   | (D)               |  |

See explanatory information and SOURCE at end of table.

Table A-36. Total (company, Federal, and other) funds for industrial energy R&amp;D performance, by industry and size of company: 1987-97 and projected 1998

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| Industry and size of company                                   | SIC code                        | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995    | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |     |
|--|---------------------------------|-----------------------|------|------|------|------|------|------|------|---------|-------------------|------|-------------------|-----|
|  |                                 | [Dollars in millions] |      |      |      |      |      |      |      |         |                   |      |                   |     |
| Distribution by industry:                                      |                                 |                       |      |      |      |      |      |      |      |         |                   |      |                   |     |
| Transportation equipment.....                                  | 37                              | (S)                   | (D)  | 847  | 863  | (S)  | (D)  | (D)  | (D)  | (D)     | (D)               | (D)  | (D)               | (D) |
| Motor vehicles and motor vehicles<br>equipment .....           | 371                             | (D)                   | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)     | (D)               | (D)  | (D)               | (D) |
| Other transportation equipment.....                            | 373-75,379                      | (D)                   | (D)  | (D)  | (D)  | 0    | 0    | 0    | 0    | 0       | 0                 | 0    | 0                 | 0   |
| Aircraft and missiles.....                                     | 372,376                         | 754                   | 652  | 577  | 626  | (D)  | 478  | 381  | (D)  | (D)     | (D)               | (D)  | (D)               | (D) |
| Professional and scientific instruments.....                   | 38                              | 17                    | 16   | 12   | 11   | (S)  | (S)  | (D)  | (D)  | (D)     | 0                 | 1    | 1                 | 1   |
| Scientific and mechanical measuring<br>instruments .....       | 381-82                          | (D)                   | (D)  | (D)  | (D)  | (D)  | (D)  | 0    | (D)  | 0       | 0                 | 1    | 1                 | 1   |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87                          | (D)                   | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)     | 0                 | 0    | 0                 | 0   |
| Other manufacturing industries <sup>3</sup> .....              | 27,31,39                        | 0                     | 0    | (D)  | (D)  | (D)  | 0    | 0    | 0    | (D)     | 0                 | 0    | 0                 | 0   |
| Nonmanufacturing <sup>2</sup> .....                            | 433                             | 551                   | 614  | 730  | 697  | 594  | 636  | 809  | 533  | 421     | 371               | 342  |                   |     |
| Transportation and utilities.....                              | 40-42,44-49                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 106     | 100               | 76   | 66                |     |
| Communications.....  | 48                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |     |
| Telephone communications.....                                  | 481                             | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |     |
| Other communications.....                                      | 482-484,489                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |     |
| Electric, gas, and sanitary services.....                      | 49                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 106     | (D)               | (D)  | (D)               |     |
| Other transportation and utilities.....                        | 40-42,44-47                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | (D)               | (D)  | (D)               |     |
| Trade.....   | 50-59                           | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)     | (D)               | 0    | 0                 |     |
| Finance, insurance, and real estate.....                       | 60-65,67                        | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |     |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 218 (S) | 94                | 169  | 112               |     |
| Business services.....   | 73                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | (D)  | (D)               |     |
| Computer and data processing<br>services .....                 | 737                             | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |     |
| Other business services.....                                   | 731-736,738                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | (D)  | (D)               |     |

See explanatory information and SOURCE at end of table.

Table A-36. Total (company, Federal, and other) funds for industrial energy R&amp;D performance, by industry and size of company: 1987-97 and projected 1998

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| Industry and size of company   | SIC code                     | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |  |
|--|------------------------------|-----------------------|------|------|------|------|------|------|------|------|-------------------|------|-------------------|--|
|  |                              | [Dollars in millions] |      |      |      |      |      |      |      |      |                   |      |                   |  |
| Distribution by industry:  |                              |                       |      |      |      |      |      |      |      |      |                   |      |                   |  |
| Health services.....   | 80                           | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | 0    | 0                 |  |
| Offices and clinics of medical doctors, hospitals,<br>medical and dental labs..... | 801,806,807                  | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | 0    | 0                 |  |
| Other health services.....   | 802-805,808-809              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0    | 0                 | 0    | 0                 |  |
| Engineering and management services .....  | 87                           | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | (D)  | (D)               |  |
| Engineering, architectural, and surveying .....                                    | 871                          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 93   | 80                | 98   | 80                |  |
| Research, development, and testing .....   | 873                          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | (D)  | (D)               |  |
| Other engineering and management services.....                                     | 872,874                      | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0    | 0                 | 0    | 0                 |  |
| Other services.....  | 701,72,75-79,81,<br>83,84,89 | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0    | 0                 | 0    | 0                 |  |
| Other nonmanufacturing industries <sup>3</sup> .....                               | 07-12,14,15,<br>161-162,17   | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | (D)  | (D)               |  |

See explanatory information and SOURCE at end of table.

**Table A-36. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry and size of company: 1987-97 and projected 1998**

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| Industry and size of company                              | SIC code | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994  | 1995  | 1996 <sup>1</sup> | 1997  | Projected<br>1998 |  |
|---|----------|-----------------------|------|------|------|------|------|------|-------|-------|-------------------|-------|-------------------|--|
|   |          | [Dollars in millions] |      |      |      |      |      |      |       |       |                   |       |                   |  |
| Distribution by size of company:<br>[Number of employees] |          |                       |      |      |      |      |      |      |       |       |                   |       |                   |  |
| Total.....  |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 2,549 | 2,330 | 2,184             | 1,640 | 1,375             |  |
| Fewer than 500.....                                       |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 28    | 39    | 39                | 101   | 50                |  |
| 500 to 999.....   |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 86    | 22    | 24                | 11    | 9                 |  |
| 1,000 to 4,999.....                                       |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 76    | 45    | 24                | 112   | 131               |  |
| 5,000 to 9,999.....                                       |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 48    | 48    | 47                | 10    | 7                 |  |
| 10,000 to 24,999.....                                     |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 782   | 749   | 640               | 437   | 472               |  |
| 25,000 or more.....                                       |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 1,529 | 1,427 | 1,410             | 971   | 706               |  |

<sup>1</sup> Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

<sup>2</sup> Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

<sup>3</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTES:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

Energy and pollution-abatement R&D data are collected only on Form RD-1L, which is sent to larger R&D-performing companies for odd-numbered survey years (see the technical notes in Section B of this report for an explanation of the various survey questionnaires). Consequently, the universe of companies that perform energy or pollution-abatement R&D may not be represented by the statistics in this table.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

| Table A-37. Company and other (except Federal) funds for industrial energy R&D performance, by selected industry: 1987-97 and projected 1998 |   |                       |       |       |       |       |       |       |       |       |                   |      |                   |
|--|---|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|------|-------------------|
| Industry   | SIC code  | 1987                  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995  | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |
|  |   | [Dollars in millions] |       |       |       |       |       |       |       |       |                   |      |                   |
| Total.....   |   | 2,410                 | 2,317 | 2,418 | 2,558 | 2,691 | 2,084 | 1,694 | 1,660 | 1,360 | 1,306             | 884  | 927               |
| Chemicals and allied products.....   | 28  | (D)                   | 59    | 97    | 412   | (D)   | (D)   | (D)   | (D)   | 35    | 35                | 46   | 44                |
| Petroleum refining and extraction .....  | 13,29   | 911                   | 1,050 | 1,124 | 1,174 | 1,409 | 1,143 | 790   | 596   | 646   | 617               | 387  | 413               |
| Machinery.....   | 35  | (D)                   | 229   | 246   | 220   | (S)   | 146   | 177   | 270   | 108   | 110               | 78   | 74                |
| Electrical equipment.....  | 36  | (D)                   | 123   | 92    | 90    | 101   | 159   | 114   | 174   | (D)   | (D)               | (D)  | (D)               |
| Aircraft and missiles.....   | 372,376   | (D)                   | 211   | 160   | 199   | (D)   | (D)   | (D)   | (D)   | (D)   | (D)               | (D)  | (D)               |
| All other manufacturing industries.....  |   | 564                   | 450   | 451   | 173   | (S)   | 41    | 24    | 73    | 30    | 33                | 27   | 29                |
| Nonmanufacturing industries.....   | 07-10,12-17,<br>40-42,44-49,<br>50-59,60-65,67,<br>701,73,75-76,<br>78-79,80-81,<br>83-84,87,89 | 170                   | 195   | 248   | 290   | 274   | 281   | 403   | 449   | 398   | (D)               | 269  | 281               |

<sup>1</sup> Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**NOTES:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

Energy and pollution-abatement R&D data are collected only on Form RD-1L, which is sent to larger R&D-performing companies for odd-numbered survey years (see the technical notes in Section B of this report for an explanation of the various survey questionnaires). Consequently, the universe of companies that perform energy or pollution-abatement R&D may not be represented by the statistics in this table.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

| Table A-38. Federal funds for industrial energy R&D performance, by selected industry: 1987-97 and projected 1998 |   |                       |       |       |       |       |       |       |      |      |                   |      |                   |
|---|---|-----------------------|-------|-------|-------|-------|-------|-------|------|------|-------------------|------|-------------------|
| Industry  | SIC code  | 1987                  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994 | 1995 | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |
|   |   | [Dollars in millions] |       |       |       |       |       |       |      |      |                   |      |                   |
| Total.....  |   | 1,166                 | 1,389 | 1,371 | 1,446 | 1,924 | 1,141 | 1,053 | 888  | 970  | 878               | 756  | 448               |
| Chemicals and allied products....   | 28  | (D)                   | 13    | 14    | 5     | (D)   | (D)   | (D)   | (D)  | (D)  | (D)               | (D)  | (D)               |
| Petroleum refining and extraction.....  | 13,29   | 3                     | 6     | 4     | 3     | 6     | 7     | 8     | (D)  | (D)  | (D)               | 0    | 0                 |
| Machinery.....  | 35  | (D)                   | 15    | 14    | 34    | (S)   | (D)   | (D)   | (D)  | (D)  | (D)               | (D)  | (D)               |
| Electrical equipment.....   | 36  | (D)                   | 557   | 555   | 537   | (D)   | (D)   | (D)   | (D)  | (D)  | (D)               | (D)  | (D)               |
| Aircraft and missiles.....  | 372,376   | (D)                   | 441   | 417   | 427   | (D)   | (D)   | (D)   | (D)  | (D)  | (D)               | (D)  | (D)               |
| All other manufacturing industries.....   |   | 5                     | 1     | 0     | 2     | 1     | 2     | 2     |      | 1    | 1                 | 0    | 0                 |
| Nonmanufacturing industries.....  | 07-10,12-17,<br>40-42,44-49,<br>50-59,60-65,67,<br>701,73,75-76,<br>78-79,80-81,<br>83-84,87,89 | 263                   | 356   | 367   | 438   | 423   | 313   | 233   | 359  | 134  | 49                | 102  | 61                |

<sup>1</sup> Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**NOTES:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

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**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-39. Total (company, Federal, and other) funds for industrial energy R&D performance, by primary energy source: 1987-97 and projected 1998**

| Primary energy source  | 1987                  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995  | 1996 <sup>1</sup> | 1997  | Projected<br>1998 |
|--|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|-------|-------------------|
|  | [Dollars in millions] |       |       |       |       |       |       |       |       |                   |       |                   |
| Total.....   | 3,576                 | 3,706 | 3,789 | 4,004 | 4,615 | 3,225 | 2,747 | 2,549 | 2,330 | 2,184             | 1,640 | 1,375             |
| Fossil fuels.....  | 1,548                 | 1,583 | 1,652 | 1,879 | 2,128 | 1,498 | 1,082 | 966   | 811   | 838               | 752   | 737               |
| Oil.....   | (S)                   | NA    | (S)   | NA    | (S)   | NA    | 693   | NA    | 608   | 627               | 328   | 289               |
| Gas.....   | 191                   | NA    | (S)   | NA    | (S)   | NA    | 215   | NA    | 124   | 104               | 150   | 158               |
| Shale.....   | 11                    | NA    | 77    | NA    | (S)   | NA    | (D)   | NA    | 0     | 0                 | (D)   | (D)               |
| Coal.....  | 46                    | NA    | (S)   | NA    | (S)   | NA    | 97    | NA    | 62    | (D)               | 155   | 132               |
| Synthetic fossil fuels.....                                    | 23                    | NA    | 17    | NA    | (S)   | NA    | 23    | NA    | (D)   | (D)               | 37    | (D)               |
| Mining.....  | 3                     | NA    | (S)   | NA    | (S)   | NA    | (D)   | NA    | 3     | (D)               | 31    | 29                |
| Other.....   | (S)                   | NA    | (S)   | NA    | (S)   | NA    | (D)   | NA    | (D)   | (D)               | 87    | (D)               |
| Other fossil fuels.....  | 51                    | NA    | (S)   | NA    | 58    | NA    | (D)   | NA    | 17    | (D)               | (D)   | (D)               |
| Nuclear.....   | 926                   | 1,098 | 919   | 973   | 1,139 | 849   | 818   | (D)   | 255   | 160               | 86    | 91                |
| Fission.....   | 859                   | NA    | 856   | NA    | 1,134 | NA    | (D)   | NA    | (D)   | (D)               | 58    | (D)               |
| Fusion.....  | (S)                   | NA    | 63    | NA    | 5     | NA    | (D)   | NA    | (D)   | (D)               | 28    | (D)               |
| Total geothermal, solar, and conservation and utilization..... | 421                   | 492   | 612   | (D)   | 866   | 608   | 442   | 469   | 380   | 353               | 149   | 147               |
| Geothermal.....  | 48                    | NA    | (D)   | NA    | (S)   | NA    | 90    | NA    | (D)   | (D)               | (D)   | (D)               |
| Solar.....   | 95                    | NA    | (D)   | NA    | (S)   | NA    | 59    | NA    | (D)   | (D)               | (D)   | (D)               |
| Conservation and utilization.....                              | 281                   | NA    | 391   | NA    | (S)   | NA    | 293   | NA    | 219   | 201               | 101   | 104               |
| All other energy.....  | (S)                   | 533   | 606   | 681   | 507   | 271   | 404   | (D)   | 884   | 833               | 652   | 399               |

<sup>1</sup> Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTES:** Detailed data for 1987 were estimated on the basis of (a) data actually reported that year, (b) revised data for the year reported on the 1988 survey form, and (c) adjustments to a new sample design in 1987.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

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**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-40. Company and other (except Federal) funds for industrial energy R&D performance, by primary energy source: 1987-97 and projected 1998**

| Primary energy source  | 1987                  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995  | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |
|--|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|------|-------------------|
|  | [Dollars in millions] |       |       |       |       |       |       |       |       |                   |      |                   |
| Total.....   | 2,410                 | 2,317 | 2,418 | 2,558 | 2,691 | 2,084 | 1,694 | 1,660 | 1,360 | 1,306             | 884  | 927               |
| Fossil fuels.....  | (D)                   | 1,519 | 1,485 | 1,704 | 1,869 | 1,414 | 1,003 | 874   | 787   | 816               | 679  | 693               |
| Oil.....   | (S)                   | NA    | (S)   | NA    | (S)   | NA    | (D)   | NA    | (D)   | 623               | (D)  | 282               |
| Gas.....   | (S)                   | NA    | (S)   | NA    | (S)   | NA    | 210   | NA    | (D)   | (D)               | 146  | (D)               |
| Shale.....   | (S)                   | NA    | (S)   | NA    | (S)   | NA    | 0     | NA    | 0     | 0                 | (D)  | (D)               |
| Coal.....  | 29                    | NA    | (S)   | NA    | (S)   | NA    | 57    | NA    | 43    | 73                | 123  | 100               |
| Synthetic fossil fuels.....                                    | (S)                   | NA    | (D)   | NA    | (S)   | NA    | (D)   | NA    | (D)   | (D)               | (D)  | (D)               |
| Mining.....  | (D)                   | NA    | (D)   | NA    | (D)   | NA    | 0     | NA    | 3     | (D)               | 17   | 7                 |
| Other.....   | (D)                   | NA    | (S)   | NA    | (D)   | NA    | (D)   | NA    | (D)   | (D)               | (D)  | (D)               |
| Other fossil fuels.....  | (S)                   | NA    | (S)   | NA    | (S)   | NA    | (D)   | NA    | (D)   | (D)               | (D)  | (D)               |
| Nuclear.....   | 109                   | 117   | 39    | 72    | 46    | 72    | 58    | (D)   | (D)   | (D)               | 47   | (D)               |
| Fission.....   | 82                    | NA    | 27    | NA    | 45    | NA    | (D)   | NA    | 63    | (D)               | (D)  | (D)               |
| Fusion.....  | (S)                   | NA    | 12    | NA    | 1     | NA    | (D)   | NA    | (D)   | (D)               | (D)  | (D)               |
| Total geothermal, solar, and conservation and utilization..... | (D)                   | 314   | 416   | 278   | 478   | 474   | 307   | 300   | 245   | 226               | (D)  | (D)               |
| Geothermal.....  | (D)                   | NA    | (D)   | NA    | (S)   | NA    | (D)   | NA    | (D)   | (D)               | (D)  | (D)               |
| Solar.....   | 41                    | NA    | (D)   | NA    | (S)   | NA    | (D)   | NA    | 14    | (D)               | (D)  | (D)               |
| Conservation and utilization.....                              | (D)                   | NA    | 384   | NA    | (S)   | NA    | 203   | NA    | (D)   | (D)               | (D)  | (D)               |
| All other energy.....  | (D)                   | 367   | 478   | 504   | 298   | 124   | 325   | (D)   | (D)   | (D)               | (D)  | (D)               |

<sup>1</sup> Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTES:** Detailed data for 1987 were estimated on the basis of (a) data actually reported that year, (b) revised data for the year reported on the 1988 survey form, and (c) adjustments to a new sample design in 1987.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

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**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-41. Federal funds for industrial energy R&D performance, by primary energy source: 1987-97 and projected 1998**

| Primary energy source  | 1987                  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994   | 1995 | 1996 <sup>1</sup> | 1997 | Projected 1998 |
|--|-----------------------|-------|-------|-------|-------|-------|-------|--------|------|-------------------|------|----------------|
|  | [Dollars in millions] |       |       |       |       |       |       |        |      |                   |      |                |
| Total.....   | 1,166                 | 1,389 | 1,371 | 1,446 | 1,924 | 1,141 | 1,053 | 888    | 970  | 878               | 756  | 448            |
| Fossil fuels.....  | (D)                   | 63    | (D)   | (D)   | (S)   | 84    | 79    | 92     | 24   | 22                | 73   | 44             |
| Oil.....   | (S)                   | NA    | (S)   | NA    | (S)   | NA    | (D)   | NA     | (D)  | 4                 | (D)  | 7              |
| Gas.....   | (D)                   | NA    | (S)   | NA    | (S)   | NA    | 5     | NA     | (D)  | (D)               | 4    | (D)            |
| Shale.....   | (D)                   | NA    | (S)   | NA    | (S)   | NA    | (D)   | NA     | 0    | 0                 | (D)  | 0              |
| Coal.....  | 17                    | NA    | (S)   | NA    | (S)   | NA    | 40    | NA     | 19   | (D)               | 32   | 32             |
| Synthetic fossil fuels.....                                    | 8                     | NA    | (D)   | NA    | (S)   | NA    | (D)   | NA     | (D)  | (D)               | (D)  | (D)            |
| Mining.....  | (D)                   | NA    | (D)   | NA    | (D)   | NA    | (D)   | NA     | 0    | 0                 | 14   | 22             |
| Other.....   | (D)                   | NA    | (S)   | NA    | (D)   | NA    | (S)   | NA     | (D)  | (D)               | (D)  | (D)            |
| Other fossil fuels.....  | 1                     | NA    | (S)   | NA    | (S)   | NA    | (D)   | NA     | (D)  | (D)               | (D)  | (D)            |
| Nuclear.....   | 817                   | 979   | 859   | 885   | 1,093 | 776   | 759   | 536    | (D)  | (D)               | 39   | (D)            |
| Fission.....   | 777                   | NA    | 809   | NA    | 1,089 | NA    | (D)   | NA     | (D)  | (D)               | (D)  | (D)            |
| Fusion.....  | (S)                   | NA    | 50    | NA    | 4     | NA    | (D)   | NA     | (D)  | (D)               | (D)  | (D)            |
| Total geothermal, solar, and conservation and utilization..... | (D)                   | 178   | (D)   | (D)   | (S)   | 135   | 136   | 169    | 135  | 127               | (D)  | (D)            |
| Geothermal.....  | (D)                   | NA    | (D)   | NA    | 11    | NA    | (D)   | NA     | (D)  | (D)               | 7    | 9              |
| Solar.....   | 37                    | NA    | (D)   | NA    | 38    | NA    | (D)   | NA     | (D)  | (D)               | (D)  | (D)            |
| Conservation and utilization.....                              | (D)                   | NA    | (D)   | NA    | (S)   | NA    | (S)   | NA     | (D)  | (D)               | (D)  | (D)            |
| All other energy.....  | (D)                   | 165   | (D)   | 174   | (S)   | 146   | 79    | 91 (S) | (D)  | (D)               | (D)  | (D)            |

<sup>1</sup> Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTES:** Detailed data for 1987 were estimated on the basis of (a) data actually reported, (b) revised reported data from the 1988 survey form, and (c) adjustments to a new sample design in 1987.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

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**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-42. Number of companies performing industrial energy R&amp;D and total number of R&amp;D-performing companies, by industry and size of company: 1997

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| Industry  | SIC code       | Size of company     |        |                          |        |                      |        |                          |        |                          |        |                            |        |
|---|----------------|---------------------|--------|--------------------------|--------|----------------------|--------|--------------------------|--------|--------------------------|--------|----------------------------|--------|
|   |                | Total all companies |        | Fewer than 500 employees |        | 500 to 999 employees |        | 1,000 to 4,999 employees |        | 5,000 to 9,999 employees |        | 10,000 to 24,999 employees |        |
|   |                | Total               | Energy | Total                    | Energy | Total                | Energy | Total                    | Energy | Total                    | Energy | Total                      | Energy |
| All Industries.....                             |                | 35,112              | 88     | 31,995                   | 22     | 1,127                | 6      | 1,302                    | 18     | 322                      | 7      | 199                        | 23     |
| Manufacturing.....                              |                | 18,130              | 52     | 15,898                   | 7      | 886                  | 4      | 938                      | 12     | 197                      | 3      | 138                        | 16     |
| Food, kindred, and tobacco products....         | 20,21          | 696                 | 1      | 426                      | 0      | 112                  | 0      | 115                      | 0      | 17                       | 0      | 15                         | 1      |
| Textiles and apparel.....                       | 22,23          | 278                 | 0      | 181                      | 0      | 44                   | 0      | 41                       | 0      | 3                        | 0      | 7                          | 0      |
| Lumber, wood products, and furniture.....       | 24,25          | 257                 | 0      | 162                      | 0      | 52                   | 0      | 29                       | 0      | 10                       | 0      | 4                          | 0      |
| Paper and allied products.....                  | 26             | 121                 | 2      | 57                       | 0      | 2                    | 0      | 41                       | 0      | 6                        | 1      | 9                          | 0      |
| Chemicals and allied products.....              | 28             | 602                 | 11     | 424                      | 0      | 32                   | 4      | 95                       | 2      | 27                       | 1      | 17                         | 3      |
| Industrial chemicals.....                       | 281-82,286     | 161                 | 4      | 91                       | 0      | 8                    | 0      | 42                       | 0      | 11                       | 0      | 7                          | 3      |
| Drugs and medicines.....                        | 283            | 199                 | 0      | 159                      | 0      | 3                    | 0      | 22                       | 0      | 7                        | 0      | 5                          | 0      |
| Other chemicals.....                            | 284-85,287-89  | 242                 | 7      | 174                      | 0      | 21                   | 4      | 32                       | 2      | 9                        | 1      | 5                          | 0      |
| Petroleum refining and extraction.....          | 13,29          | 26                  | 8      | 2                        | 0      | 3                    | 0      | 11                       | 1      | 0                        | 0      | 7                          | 5      |
| Rubber products.....                            | 30             | 639                 | 2      | 459                      | 0      | 93                   | 0      | 73                       | 2      | 7                        | 0      | 5                          | 0      |
| Stone, clay, and glass products.....            | 32             | 98                  | 1      | 65                       | 0      | 10                   | 0      | 13                       | 0      | 5                        | 0      | 5                          | 1      |
| Primary metals.....                             | 33             | 250                 | 4      | 126                      | 0      | 63                   | 0      | 31                       | 1      | 17                       | 1      | 10                         | 1      |
| Ferrous metals and products.....                | 331-32,3398-99 | 54                  | 3      | 11                       | 0      | 4                    | 0      | 17                       | 0      | 14                       | 1      | 8                          | 1      |
| Nonferrous metals and products.....             | 333-36         | 196                 | 1      | 116                      | 0      | 59                   | 0      | 14                       | 1      | 3                        | 0      | 2                          | 0      |
| Fabricated metal products.....                  | 34             | 903                 | 3      | 731                      | 3      | 74                   | 0      | 74                       | 0      | 10                       | 0      | 11                         | 0      |
| Machinery.....                                  | 35             | 1,536               | 10     | 1,233                    | 1      | 108                  | 0      | 144                      | 5      | 28                       | 0      | 18                         | 3      |
| Office, computing, and accounting machines..... | 357            | 119                 | 0      | 77                       | 0      | 10                   | 0      | 16                       | 0      | 8                        | 0      | 6                          | 0      |
| Other machinery, except electrical.....         | 351-56,358-59  | 1,417               | 10     | 1,156                    | 1      | 98                   | 0      | 128                      | 5      | 20                       | 0      | 12                         | 3      |
| Electrical equipment.....                       | 36             | 1,547               | 4      | 1,217                    | 1      | 140                  | 0      | 136                      | 1      | 33                       | 0      | 11                         | 1      |
| Radio and TV receiving equipment.....           | 365            | 19                  | 0      | 14                       | 0      | 2                    | 0      | 3                        | 0      | 0                        | 0      | 0                          | 0      |
| Communication equipment.....                    | 366            | 322                 | 2      | 255                      | 1      | 25                   | 0      | 23                       | 1      | 16                       | 0      | 0                          | 3      |
| Electronic components.....                      | 367            | 748                 | 0      | 625                      | 0      | 60                   | 0      | 46                       | 0      | 10                       | 0      | 5                          | 0      |
| Other electrical equipment.....                 | 361-64,369     | 460                 | 2      | 323                      | 0      | 54                   | 0      | 64                       | 0      | 7                        | 0      | 6                          | 1      |

See explanatory information and SOURCE at end of table.

Table A-42. Number of companies performing industrial energy R&amp;D and total number of R&amp;D-performing companies, by industry and size of company: 1997

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| Industry   | SIC code                        | Size of company        |        |                             |        |                         |        |                             |        |                             |        |                               |        |    |   |
|--|---------------------------------|------------------------|--------|-----------------------------|--------|-------------------------|--------|-----------------------------|--------|-----------------------------|--------|-------------------------------|--------|----|---|
|  |                                 | Total<br>all companies |        | Fewer than 500<br>employees |        | 500 to 999<br>employees |        | 1,000 to 4,999<br>employees |        | 5,000 to 9,999<br>employees |        | 10,000 to 24,999<br>employees |        |    |   |
|  |                                 | Total                  | Energy | Total                       | Energy | Total                   | Energy | Total                       | Energy | Total                       | Energy | Total                         | Energy |    |   |
| Transportation equipment.....                                  | 37                              | 411                    | 4      | 302                         | 0      | 54                      | 0      | 18                          | 0      | 14                          | 0      | 10                            | 1      | 13 | 3 |
| Motor vehicles and motor<br>vehicles equipment .....           | 371                             | 377                    | 1      | 300                         | 0      | 51                      | 0      | 6                           | 0      | 8                           | 0      | 8                             | 1      | 4  | 0 |
| Other transportation equipment.....                            | 373-75,379                      | 10                     | 0      | 0                           | 0      | 2                       | 0      | 4                           | 0      | 1                           | 0      | 1                             | 0      | 2  | 0 |
| Aircraft and missiles.....                                     | 372,376                         | 24                     | 3      | 2                           | 0      | 1                       | 0      | 8                           | 0      | 5                           | 0      | 1                             | 0      | 7  | 3 |
| Professional and scientific<br>instruments .....               | 38                              | 760                    | 2      | 611                         | 2      | 58                      | 0      | 74                          | 0      | 10                          | 0      | 3                             | 0      | 5  | 0 |
| Scientific and mechanical<br>measuring instruments.....        | 381-82                          | 515                    | 2      | 440                         | 2      | 37                      | 0      | 29                          | 0      | 4                           | 0      | 2                             | 0      | 3  | 0 |
| Optical, surgical, photographic,<br>and other instruments..... | 384-87                          | 246                    | 0      | 171                         | 0      | 21                      | 0      | 45                          | 0      | 6                           | 0      | 1                             | 0      | 2  | 0 |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39                        | 10,005                 | 0      | 9,901                       | 0      | 40                      | 0      | 44                          | 0      | 10                          | 0      | 6                             | 0      | 4  | 0 |
| Nonmanufacturing.....  |                                 | 16,982                 | 36     | 16,097                      | 15     | 241                     | 2      | 364                         | 6      | 125                         | 4      | 61                            | 7      | 94 | 2 |
| Transportation and utilities.....                              | 40-42,44-49                     | 417                    | 15     | 204                         | 0      | 5                       | 0      | 65                          | 4      | 67                          | 4      | 10                            | 6      | 66 | 1 |
| Communications.....  | 48                              | 90                     | 0      | 24                          | 0      | 2                       | 0      | 4                           | 0      | 51                          | 0      | 0                             | 0      | 9  | 0 |
| Telephone communications.....                                  | 481                             | 59                     | 0      | 0                           | 0      | 0                       | 0      | 0                           | 0      | 51                          | 0      | 0                             | 0      | 8  | 0 |
| Other communications.....                                      | 482-484,489                     | 31                     | 0      | 24                          | 0      | 2                       | 0      | 4                           | 0      | 0                           | 0      | 0                             | 0      | 1  | 0 |
| Electric, gas, and sanitary<br>services.....                   | 49                              | 161                    | 14     | 77                          | 0      | 2                       | 0      | 57                          | 4      | 14                          | 4      | 9                             | 6      | 2  | 0 |
| Other transportation and utilities.....                        | 40-42,44-47                     | 166                    | 1      | 103                         | 0      | 1                       | 0      | 4                           | 0      | 2                           | 0      | 1                             | 0      | 55 | 1 |
| Trade.....   | 50-59                           | 3,713                  | 0      | 3,567                       | 0      | 14                      | 0      | 73                          | 0      | 20                          | 0      | 30                            | 0      | 10 | 0 |
| Finance, insurance, and real estate.....                       | 60-65,67                        | 382                    | 0      | 309                         | 0      | 31                      | 0      | 23                          | 0      | 9                           | 0      | 3                             | 0      | 7  | 0 |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 4,891                  | 18     | 4,482                       | 13     | 182                     | 2      | 179                         | 2      | 20                          | 0      | 17                            | 1      | 11 | 0 |
| Business services.....   | 73                              | 2,455                  | 1      | 2,276                       | 0      | 84                      | 0      | 65                          | 1      | 14                          | 0      | 5                             | 0      | 10 | 0 |
| Computer and data<br>processing services.....                  | 737                             | 2,273                  | 0      | 2,144                       | 0      | 63                      | 0      | 51                          | 0      | 10                          | 0      | 3                             | 0      | 3  | 0 |
| Other business services.....                                   | 731-736,738                     | 181                    | 1      | 133                         | 0      | 22                      | 0      | 14                          | 1      | 4                           | 0      | 2                             | 0      | 7  | 0 |

See explanatory information and SOURCE at end of table.

Table A-42. Number of companies performing industrial energy R&amp;D and total number of R&amp;D-performing companies, by industry and size of company: 1997

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| Industry  | SIC code                     | Size of company     |        |                          |        |                      |        |                          |        |                          |        |                            |        |
|---|------------------------------|---------------------|--------|--------------------------|--------|----------------------|--------|--------------------------|--------|--------------------------|--------|----------------------------|--------|
|   |                              | Total all companies |        | Fewer than 500 employees |        | 500 to 999 employees |        | 1,000 to 4,999 employees |        | 5,000 to 9,999 employees |        | 10,000 to 24,999 employees |        |
|   |                              | Total               | Energy | Total                    | Energy | Total                | Energy | Total                    | Energy | Total                    | Energy | Total                      | Energy |
| Health services.....  | 80                           | 483                 | 0      | 456                      | 0      | 3                    | 0      | 21                       | 0      | 0                        | 0      | 3                          | 0      |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                  | 427                 | 0      | 404                      | 0      | 3                    | 0      | 17                       | 0      | 0                        | 0      | 3                          | 0      |
| Other health services.....  | 802-805,808-809              | 56                  | 0      | 52                       | 0      | 0                    | 0      | 4                        | 0      | 0                        | 0      | 0                          | 0      |
| Engineering and management services .....                                       | 87                           | 1,569               | 17     | 1,495                    | 13     | 42                   | 2      | 23                       | 1      | 3                        | 0      | 5                          | 1      |
| Engineering, architectural, and surveying .....                                 | 871                          | 697                 | 8      | 661                      | 5      | 14                   | 1      | 18                       | 1      | 1                        | 0      | 3                          | 1      |
| Research, development, and testing .....  | 873                          | 727                 | 9      | 711                      | 8      | 13                   | 1      | 2                        | 0      | 0                        | 0      | 0                          | 1      |
| Other engineering and management services.....                                  | 872, 874                     | 145                 | 0      | 123                      | 0      | 15                   | 0      | 3                        | 0      | 2                        | 0      | 2                          | 0      |
| Other services.....   | 701,72,75-79,81,<br>83,84,89 | 385                 | 0      | 255                      | 0      | 53                   | 0      | 70                       | 0      | 3                        | 0      | 4                          | 0      |
| Other nonmanufacturing industries <sup>1</sup> ....                             | 07-12,14,15,<br>161-162,17   | 7,579               | 3      | 7,535                    | 2      | 8                    | 0      | 24                       | 0      | 9                        | 0      | 1                          | 1      |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**NOTES:** Energy and pollution-abatement R&D data are collected only on Form RD-1L, which is sent to larger R&D-performing companies for odd-numbered survey years (see the technical notes in Section B of this report for an explanation of the various survey questionnaires). Consequently, the universe of companies that perform energy or pollution-abatement R&D may not be represented by the statistics in this table.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-43. Total (company, Federal, and other) funds for industrial pollution-abatement R&amp;D performance, by industry and size of company: 1987-97 and projected 1998

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| Industry and size of company                        | SIC code       | 1987                  | 1988 | 1989         | 1990  | 1991  | 1992 | 1993 | 1994 | 1995 | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |  |
|---|----------------|-----------------------|------|--------------|-------|-------|------|------|------|------|-------------------|------|-------------------|--|
|   |                | [Dollars in millions] |      |              |       |       |      |      |      |      |                   |      |                   |  |
| All Industries.....                                 |                | (S)                   | (S)  | 1,372        | 1,044 | 1,326 | 638  | 845  | 931  | (D)  | 627               | 462  | 291               |  |
| Distribution by industry:                           |                |                       |      |              |       |       |      |      |      |      |                   |      |                   |  |
| Manufacturing.....                                  |                | (S)                   | (S)  | 1,372        | 1,044 | 1,186 | 583  | 769  | 739  | 594  | 513               | 381  | 210               |  |
| Food, kindred, and tobacco products.....            | 20,21          | 1                     | 1    | 3            | 2     | 4     | 2    | (S)  | 4    | 4    | (D)               | (D)  | (D)               |  |
| Textiles and apparel.....                           | 22,23          | <sup>4</sup>          | (S)  | <sup>4</sup> | (S)   | (S)   | (S)  | 0    | (D)  | (D)  | (D)               | (D)  | (D)               |  |
| Lumber, wood products, and furniture.....           | 24,25          | (D)                   | (D)  | (D)          | (D)   | (D)   | 1    | 1    | 2    | (D)  | (D)               | (D)  | (D)               |  |
| Paper and allied products.....                      | 26             | 7                     | 9    | 19           | 18    | 13    | 10   | 14   | 15   | 10   | 7                 | 5    | 5                 |  |
| Chemicals and allied products.....                  | 28             | 117                   | 136  | 178          | 163   | 188   | 127  | (D)  | 157  | 101  | 88                | 12   | 15                |  |
| Industrial chemicals.....                           | 281-82,286     | (D)                   | 117  | 61           | (D)   | (S)   | 87   | 135  | 134  | 93   | 80                | 10   | (D)               |  |
| Drugs and medicines.....                            | 283            | (D)                   | (D)  | (D)          | (D)   | 16    | 16   | (D)  | (D)  | (D)  | (D)               | (D)  | (D)               |  |
| Other chemicals.....                                | 284-85,287-89  | 12                    | (D)  | (D)          | 67    | 26    | 24   | (D)  | (D)  | (D)  | (D)               | (D)  | 3                 |  |
| Petroleum refining and extraction.....              | 13,29          | 51                    | 60   | 75           | 72    | 111   | 107  | 111  | 102  | 34   | 43                | 40   | 31                |  |
| Rubber products.....                                | 30             | (D)                   | (S)  | 1            | 1     | 1     | 1    | (D)  | 2    | 2    | (D)               | (D)  | 3                 |  |
| Stone, clay, and glass products.....                | 32             | (D)                   | (D)  | (D)          | (D)   | (D)   | 39   | 44   | 47   | (D)  | (D)               | (D)  | (D)               |  |
| Primary metals.....                                 | 33             | 5                     | 9    | 10           | 8     | (S)   | 4    | 3    | (D)  | 19   | 11                | 12   | 2                 |  |
| Ferrous metals and products.....                    | 331-32,3398-99 | (D)                   | (D)  | (D)          | (D)   | (D)   | (D)  | (D)  | (D)  | (D)  | (D)               | (D)  | (D)               |  |
| Nonferrous metals and products.....                 | 333-36         | (D)                   | (D)  | (D)          | (D)   | (D)   | (D)  | (D)  | (D)  | (D)  | (D)               | (D)  | (D)               |  |
| Fabricated metal products.....                      | 34             | (D)                   | (D)  | 1            | 2     | 5     | 7    | 14   | 13   | 11   | 11                | 1    | 2                 |  |
| Machinery.....                                      | 35             | 38                    | 46   | 111          | 116   | (S)   | 91   | 186  | (D)  | 222  | 194               | (D)  | (D)               |  |
| Office, computing, and accounting<br>machines ..... | 357            | 0                     | 0    | 0            | 0     | (D)   | 0    | (D)  | (D)  | 0    | 0                 | 0    | 0                 |  |
| Other machinery, except electrical.....             | 351-56,358-59  | 38                    | 46   | 111          | 116   | (D)   | 91   | (D)  | (D)  | 222  | 194               | (D)  | (D)               |  |
| Electrical equipment.....                           | 36             | (D)                   | (D)  | 9            | 11    | (D)   | (D)  | (D)  | 33   | (D)  | (D)               | 16   | 17                |  |
| Radio and TV receiving equipment.....               | 365            | 0                     | 0    | 0            | 0     | 0     | 0    | 0    | 0    | 0    | 0                 | 0    | 0                 |  |
| Communication equipment.....                        | 366            | (D)                   | (D)  | 7            | 8     | (D)   | (D)  | (D)  | (D)  | (D)  | (D)               | 0    | 0                 |  |
| Electronic components.....                          | 367            | (D)                   | 0    | (D)          | 2     | 1     | (D)  | 3    | 3    | (D)  | (D)               | (D)  | (D)               |  |
| Other electrical equipment.....                     | 361-64,369     | (D)                   | (D)  | (D)          | 1     | (D)   | (D)  | (D)  | (D)  | (D)  | (D)               | (D)  | (D)               |  |

See explanatory information and SOURCE at end of table.

**Table A-43. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by industry and size of company: 1987-97 and projected 1998**

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| Industry and size of company                                | SIC code                        | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995    | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |  |
|---|---------------------------------|-----------------------|------|------|------|------|------|------|------|---------|-------------------|------|-------------------|--|
|   |                                 | [Dollars in millions] |      |      |      |      |      |      |      |         |                   |      |                   |  |
| <b>Distribution by industry:</b>                            |                                 |                       |      |      |      |      |      |      |      |         |                   |      |                   |  |
| Transportation equipment.....                               | 37                              | (S)                   | (S)  | (S)  | (S)  | (S)  | 145  | 174  | 110  | 109     | 78                | 134  | 100               |  |
| Motor vehicles and motor vehicles equipment .....           | 371                             | (D)                   | (D)  | (D)  | (D)  | (D)  | 74   | 80   | (D)  | (D)     | 123               | 87   |                   |  |
| Other transportation equipment.....                         | 373-75,379                      | (D)                   | (D)  | (D)  | (D)  | (D)  | 0    | (D)  | (D)  | 0       | (D)               | (D)  | (D)               |  |
| Aircraft and missiles.....                                  | 372,376                         | 123                   | 103  | 120  | 195  | 114  | (D)  | (D)  | (D)  | (D)     | (D)               | (D)  | (D)               |  |
| Professional and scientific instruments.....                | 38                              | (D)                   | 3    | (D)  | 4    | 10   | 6    | 8    | (D)  | 13      | 8                 | (D)  | (D)               |  |
| Scientific and mechanical measuring instruments .....       | 381-82                          | (D)                   | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | (S) 8   | (D)               | 0    | (D)               |  |
| Optical, surgical, photographic, and other instruments..... | 384-87                          | (D)                   | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | \$6  | 5       | (D)               | (D)  | (D)               |  |
| Other manufacturing industries <sup>2</sup> .....           | 27,31,39                        | (D)                   | (D)  | 1    | (1)  | (D)  | (D)  | (D)  | (D)  | 0       | 0                 | 0    | 0                 |  |
| Nonmanufacturing <sup>3</sup> .....                         |                                 | 113                   | (S)  | (S)  | (S)  | 140  | 55   | 76   | 193  | (S) 299 | 113               | 81   | 80                |  |
| Transportation and utilities.....                           | 40-42,44-49                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 91      | 63                | 52   | 53                |  |
| Communications.....   | 48                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |  |
| Telephone communications.....                               | 481                             | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |  |
| Other communications.....                                   | 482-484,489                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |  |
| Electric, gas, and sanitary services.....                   | 49                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 91      | (D)               | 52   | 53                |  |
| Other transportation and utilities.....                     | 40-42,44-47                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | (D)               | 0    | 0                 |  |
| Trade.....  | 50-59                           | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)     | (D)               | (D)  | (D)               |  |
| Finance, insurance, and real estate.....                    | 60-65,67                        | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)     | 20                | 20   | 17                |  |
| Business services.....                                      | 73                              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | (D)  | (D)               |  |
| Computer and data processing services .....                 | 737                             | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | 0    | 0                 |  |
| Other business services.....                                | 731-736,738                     | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0       | 0                 | (D)  | (D)               |  |

See explanatory information and SOURCE at end of table.

**Table A-43. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by industry and size of company: 1987-97 and projected 1998**

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| Industry and size of company   | SIC code                     | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |  |
|--|------------------------------|-----------------------|------|------|------|------|------|------|------|------|-------------------|------|-------------------|--|
|  |                              | [Dollars in millions] |      |      |      |      |      |      |      |      |                   |      |                   |  |
| <b>Distribution by industry:</b>   |                              |                       |      |      |      |      |      |      |      |      |                   |      |                   |  |
| Health services.....   | 80                           | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | 0    | 0                 |  |
| Offices and clinics of medical doctors, hospitals,<br>medical and dental labs..... | 801,806,807                  | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | 0    | 0                 |  |
| Other health services.....   | 802-805,808-809              | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0    | 0                 | 0    | 0                 |  |
| Engineering and management services.....   | 87                           | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | 20   | 17                |  |
| Engineering, architectural, and<br>surveying .....                                 | 871                          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | 14   | 6                 |  |
| Research, development, and testing.....  | 873                          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)  | (D)               | 6    | 11                |  |
| Other engineering and<br>management services                                       | 872,874                      | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0    | 0                 | 0    | 0                 |  |
| Other services.....  | 701,72,75-79,81,<br>83,84,89 | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 0    | 0                 | (D)  | (D)               |  |
| Other nonmanufacturing industries <sup>2</sup> .....                               | 07-12,14,15,<br>161-162,17   | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 1    | (D)               | (D)  | (D)               |  |

See explanatory information and SOURCE at end of table.

**Table A-43. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by industry and size of company: 1987-97 and projected 1998**

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| Industry and size of company                              | SIC code | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |  |
|---|----------|-----------------------|------|------|------|------|------|------|------|------|-------------------|------|-------------------|--|
|   |          | [Dollars in millions] |      |      |      |      |      |      |      |      |                   |      |                   |  |
| Distribution by size of company:<br>[Number of employees] |          |                       |      |      |      |      |      |      |      |      |                   |      |                   |  |
| Total.....  |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 931  | 892  | 627               | 462  | 291               |  |
| Fewer than 500.....                                       |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 13   | 23   | 18                | 20   | 16                |  |
| 500 to 999.....   |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 2    | 12   | 12                | 9    | 12                |  |
| 1,000 to 4,999.....                                       |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 74   | 64   | 47                | 68   | 80                |  |
| 5,000 to 9,999.....                                       |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 60   | 75   | 66                | 42   | 45                |  |
| 10,000 to 24,999.....                                     |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 307  | 374  | 212               | 159  | 93                |  |
| 25,000 or more.....                                       |          | NA                    | NA   | NA   | NA   | NA   | NA   | NA   | 475  | 344  | 271               | 163  | 44                |  |

<sup>1</sup> Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

<sup>2</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

<sup>3</sup> Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

<sup>4</sup> Less than \$0.5 million.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTES:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Energy and pollution-abatement R&D data are collected only on Form RD-1L, which is sent to larger R&D-performing companies for odd-numbered survey years (see the technical notes in Section B of this report for an explanation of the various survey questionnaires). Consequently, the universe of companies that perform energy or pollution-abatement R&D may not be represented by the statistics in this table.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-44. Company and other (except Federal) funds for industrial pollution-abatement R&D performance, by selected industry: 1987-97 and projected 1998**

| Industry                                       | SIC code  | 1987                  | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995    | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |
|--|---|-----------------------|------|------|------|------|------|------|------|---------|-------------------|------|-------------------|
|  |   | [Dollars in millions] |      |      |      |      |      |      |      |         |                   |      |                   |
| Total.....                                     |   | (S)                   | (S)  | (S)  | 955  | (S)  | 545  | 735  | 734  | 830     | 602               | 449  | 279               |
| Chemicals and allied products.....             | 28  | (D)                   | (D)  | (D)  | 163  | 188  | 126  | 149  | 153  | 101     | 88                | 12   | 15                |
| Petroleum refining and extraction.....         | 13,29   | 51                    | 60   | (D)  | (D)  | 110  | 106  | 111  | 102  | 34      | 43                | 40   | 31                |
| Machinery.....                                 | 35  | 38                    | 46   | (D)  | 116  | (S)  | 90   | 186  | (D)  | 222     | 194               | (D)  | (D)               |
| Electrical equipment.....                      | 36  | (D)                   | (D)  | (D)  | (D)  | (D)  | (D)  | (D)  | 33   | (D)     | (D)               | (D)  | (D)               |
| Aircraft and missiles.....                     | 372,376   | 62                    | (D)  | 70   | (D)  | 51   | (D)  | 28   | (D)  | (D)     | (D)               | (D)  | (D)               |
| All other manufacturing industries.....        |   | (D)                   | (D)  | 737  | 406  | (S)  | 84   | (D)  | 192  | 184     | 141               | 169  | 121               |
| Nonmanufacturing industries <sup>2</sup> ..... | 07-10,12-17,<br>40-42,44-49,<br>50-59,60-65,67,<br>701,73,75-76,<br>78-79,80-81,<br>83-84,87,89 | (D)                   | (D)  | 58   | (D)  | (D)  | 38   | 44   | 56   | 241 (S) | 92                | 71   | 70                |

<sup>1</sup> Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

<sup>2</sup> Nonmanufacturing industries for 1990 and prior years included only the following SICs: 10 11, 14 17, 40 42, 44 51, 53 54, 56, 60, 62 63, 72 73, 78, 806, 807, and 87.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

**NOTES:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

Energy and pollution-abatement R&D data are collected only on Form RD-1L, which is sent to larger R&D-performing companies for odd-numbered survey years (see the technical notes in Section B of this report for an explanation of the various survey questionnaires). Consequently, the universe of companies that perform energy or pollution-abatement R&D may not be represented by the statistics in this table.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-45. Federal funds for industrial pollution-abatement R&D performance, by selected industry: 1987-97 and projected 1998**

| Industry                                       | SIC code  | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |
|--|---|------|------|------|------|------|------|------|------|------|-------------------|------|-------------------|
| Total.....                                     |   | 186  | 191  | (S)  | 89   | 92   | 93   | 110  | 198  | (D)  | 25                | 13   | 12                |
| Chemicals and allied products.....             | 28  | (D)  | (D)  | (D)  | 0    | 0    | (D)  | (D)  | (D)  | 0    | 0                 | 0    | 0                 |
| Petroleum refining and extraction.....         | 13,29   | 0    | 0    | (D)  | (D)  | (D)  | (D)  | 0    | 0    | 0    | 0                 | 0    | 0                 |
| Machinery.....                                 | 35  | 0    | 0    | (D)  | 0    | 0    | (D)  | 0    | (D)  | 0    | 0                 | 0    | 0                 |
| Electrical equipment.....                      | 36  | (D)               | (D)  | (D)               |
| Aircraft and missiles.....                     | 372,376   | 61   | (D)  | 50   | (D)               | (D)  | (D)               |
| All other manufacturing industries.....        |   | (D)  | 0    | 0    | (D)  | (D)  | 2    | 0    | 54   | 1    | 1                 | 0    | 0                 |
| Nonmanufacturing industries <sup>2</sup> ..... | 07-10,12-17,<br>40-42,44-49,<br>50-59,60-65,67,<br>701,73,75-76,<br>78-79,80-81,<br>83-84,87,89 | (D)  | (D)  | (D)  | (D)  | (D)  | 18   | (S)  | (D)  | (D)  | 21                | 11   | 10                |

<sup>1</sup> Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

<sup>2</sup> Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10 11, 14 17, 40 42, 44 51, 53-54, 56, 60, 62 63, 72 73, 78, 806 07, and 87.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

**NOTES:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

Energy and pollution-abatement R&D data are collected only on Form RD-1L, which is sent to larger R&D-performing companies for odd-numbered survey years (see the technical notes in Section B of this report for an explanation of the various survey questionnaires). Consequently, the universe of companies that perform energy or pollution-abatement R&D may not be represented by the statistics in this table.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-46. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by type of pollution: 1987-97 and projected 1998**

| Type of pollution                   | 1987 | 1988 | 1989 | 1990  | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 <sup>1</sup> | 1997 | Projected<br>1998 |
|-------------------------------------|------|------|------|-------|------|------|------|------|------|-------------------|------|-------------------|
| [Dollars in millions]               |      |      |      |       |      |      |      |      |      |                   |      |                   |
| Total.....                          | (S)  | (S)  | (S)  | 1,044 | (S)  | 638  | 845  | 931  | (D)  | 627               | 462  | 291               |
| Air.....                            | (S)  | NA   | (S)  | NA    | (S)  | NA   | 489  | NA   | (D)  | (D)               | (D)  | (D)               |
| Automotive emission.....            | (S)  | NA   | (S)  | NA    | (S)  | NA   | 127  | NA   | 122  | 94                | (D)  | (D)               |
| Electric power plant emissions..... | 16   | NA   | 36   | NA    | (S)  | NA   | (D)  | NA   | (D)  | (D)               | (D)  | (D)               |
| All other.....                      | (S)  | NA   | (S)  | NA    | (S)  | NA   | (D)  | NA   | (D)  | (D)               | (D)  | (D)               |
| Water.....                          | (S)  | NA   | (S)  | NA    | (S)  | NA   | 87   | NA   | 68   | 53                | (D)  | (D)               |
| Solid waste.....                    | 206  | NA   | (S)  | NA    | (S)  | NA   | 124  | NA   | 59   | 42                | 32   | (D)               |
| Other.....                          | 90   | NA   | 85   | NA    | (S)  | NA   | 145  | NA   | (D)  | (D)               | (D)  | (D)               |

<sup>1</sup> Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

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**NOTES:** Detailed data for 1987 were estimated on the basis of (a) data actually reported, (b) revised reported data, (c) revised data for 1987 reported on the 1988 survey forms, and (d) adjustments to a new sample design in 1987.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

Energy and pollution-abatement R&D data are collected only on Form RD-1L, which is sent to larger R&D-performing companies for odd-numbered survey years (see the technical notes in Section B of this report for an explanation of the various survey questionnaires). Consequently, the universe of companies that perform energy or pollution-abatement R&D may not be represented by the statistics in this table.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-47. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance,  
by type of pollution and source of funds: 1996-97 and projected 1998**

| Type of pollution                   | 1996 <sup>1</sup>     |         |         | 1997  |         |         | Projected 1998 |         |         |
|-------------------------------------|-----------------------|---------|---------|-------|---------|---------|----------------|---------|---------|
|                                     | Total                 | Federal | Company | Total | Federal | Company | Total          | Federal | Company |
|                                     | [Dollars in millions] |         |         |       |         |         |                |         |         |
| Total.....                          | 627                   | 25      | 602     | 462   | 13      | 449     | 291            | 12      | 279     |
| Air.....                            | (D)                   | (D)     | 428     | (D)   | (D)     | 305     | (D)            | (D)     | 176     |
| Automotive emission.....            | 94                    | 0       | 94      | (D)   | (D)     | 116     | (D)            | (D)     | 114     |
| Electric power plant emissions..... | (D)                   | (D)     | 69      | (D)   | (D)     | 20      | (D)            | (D)     | 10      |
| All other.....                      | (D)                   | (D)     | 265     | (D)   | (D)     | 166     | (D)            | (D)     | 53      |
| Water.....                          | 53                    | 0       | 52      | (D)   | (D)     | 35      | (D)            | (D)     | 21      |
| Solid waste.....                    | 42                    | 5       | 37      | 32    | 4       | 29      | (D)            | (D)     | 16      |
| Other.....                          | (D)                   | (D)     | 85      | (D)   | (D)     | 79      | (D)            | (D)     | 64      |

<sup>1</sup> Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

**NOTES:** Energy and pollution-abatement R&D data are collected only on Form RD-1L, which is sent to larger R&D-performing companies for odd-numbered survey years (see the technical notes in Section B of this report for an explanation of the various survey questionnaires). Consequently, the universe of companies that perform energy or pollution-abatement R&D may not be represented by the statistics in this table.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-48. Total (company, Federal, and other) funds for industrial R&amp;D performance in selected years by state: 1977-97

Page 1 of 3

| Area                     | 1977                  | 1979   | 1981   | 1983   | 1985   | 1987   | 1989    | 1991    | 1993      | 1995      | 1997      |
|--------------------------|-----------------------|--------|--------|--------|--------|--------|---------|---------|-----------|-----------|-----------|
|                          | [Dollars in millions] |        |        |        |        |        |         |         |           |           |           |
| United States .....      | 29,825                | 38,226 | 51,810 | 65,268 | 84,239 | 92,155 | 102,055 | 116,952 | 117,400   | 132,103   | 157,539   |
| Northeast.....           | 8,687                 | 10,296 | 14,270 | 18,957 | 24,837 | 24,549 | 27,998  | 35,170  | 30,198    | 35,030    | 40,616    |
| New England.....         | 2,400                 | 3,003  | 3,855  | 4,680  | 7,456  | 7,965  | 8,828   | (S)     | 8,940     | 12,848    | 13,000    |
| Maine.....               | 24                    | 40     | (T)    | (T)    | (D)    | 39     | 33      | (S)     | (D)       | 286       | 83        |
| New Hampshire.....       | (T)                   | (T)    | (T)    | (T)    | (D)    | 90     | (D)     | (D)     | 247       | 472       | 652       |
| Vermont.....             | (T)                   | (T)    | (T)    | (T)    | (D)    | 236    | (D)     | (D)     | (D)       | 248       | 246       |
| Massachusetts.....       | 1,349                 | 1,690  | 1,907  | 2,466  | 4,495  | 5,255  | 5,851   | (S)     | 5,960     | 7,416     | 8,300     |
| Rhode Island.....        | 24                    | 49     | 87     | 171    | 213    | 224    | 140     | 174     | 154       | 520       | 704 (S)   |
| Connecticut.....         | 876                   | 985    | 1,514  | 1,682  | 2,129  | 2,121  | 2,421   | 1,756   | 2,228     | 3,906     | 3,014     |
| Middle Atlantic.....     | 6,287                 | 7,293  | 10,415 | 14,277 | 17,381 | 16,583 | 19,170  | 25,553  | 21,258    | 22,182    | 27,616    |
| New York.....            | 2,542                 | 2,959  | 4,057  | 5,951  | 7,561  | 6,276  | 8,107   | 9,457   | 8,597     | 8,651     | 9,939 (S) |
| New Jersey.....          | 1,900                 | 2,191  | 3,355  | 4,364  | 5,975  | 5,876  | 6,410   | 8,933   | 8,009     | 8,200     | 11,069    |
| Pennsylvania.....        | 1,845                 | 2,143  | 3,003  | 3,963  | 3,844  | 4,430  | 4,653   | (S)     | 4,652     | 5,331     | 6,609 (S) |
| North Central.....       | 7,777                 | 10,013 | 12,692 | 15,245 | 19,390 | 23,180 | 24,725  | 28,933  | 36,840    | 33,004    | 35,498    |
| East North Central ..... | 6,270                 | 8,065  | 9,742  | 11,967 | 15,254 | 17,635 | 19,395  | 24,017  | 31,800    | 26,592    | 29,249    |
| Ohio.....                | 1,323                 | 1,635  | 1,781  | 2,282  | 3,067  | 3,415  | 3,964   | 5,406   | 4,494     | 4,001     | 5,608     |
| Indiana.....             | 541                   | 723    | 1,054  | (T)    | (D)    | 1,860  | 1,823   | 2,274   | 2,141     | 2,721 (S) | 2,677     |
| Illinois.....            | 1,360                 | 1,673  | 2,077  | 2,291  | (D)    | 4,099  | 4,068   | 5,750   | 5,023     | 5,776 (S) | 6,248     |
| Michigan.....            | 2,750                 | 3,614  | 4,272  | 5,716  | 6,436  | 7,095  | 8,506   | 9,283   | 18,845    | 12,388    | 13,009    |
| Wisconsin.....           | 296                   | 420    | 558    | (T)    | 728    | 1,165  | 1,035   | 1,304   | 1,296     | 1,706     | 1,707     |
| West North Central ..... | 1,507                 | 1,948  | 2,950  | 3,278  | 4,136  | 5,545  | 5,331   | 4,916   | 5,041     | 6,412 (S) | 6,249 (S) |
| Minnesota.....           | 602                   | 802    | 1,180  | 1,814  | (D)    | 2,145  | 2,075   | 2,070   | 2,341     | 2,636 (S) | 3,116     |
| Iowa.....                | 173                   | 150    | 393    | 287    | (D)    | 328    | 365     | 527     | 505       | 998       | 578       |
| Missouri.....            | 630                   | 746    | 1,137  | (T)    | (D)    | 1,823  | 2,391   | (S)     | 1,339 (S) | 2,028 (S) | 1,290 (S) |
| North Dakota.....        | (T)                   | (T)    | (T)    | (T)    | 10     | 57     | (S)     | (S)     | (D)       | 12        | 33        |
| South Dakota.....        | (T)                   | (T)    | (T)    | (T)    | (S)    | 4      | 4       | 6       | (D)       | 19        | 26        |
| Nebraska.....            | 14                    | 15     | 28     | 26     | (D)    | 59     | 64      | 67      | 93        | 150       | 71        |
| Kansas.....              | 84                    | 216    | 211    | 293    | (D)    | 1,128  | 406     | (S)     | 280 (S)   | 569       | 1,136 (S) |

See explanatory information and SOURCE at end of table.

Table A-48. Total (company, Federal, and other) funds for industrial R&amp;D performance in selected years by state: 1977-97

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| Area                      | 1977                  | 1979   | 1981   | 1983   | 1985   | 1987   | 1989   | 1991   | 1993    | 1995      | 1997      |
|---------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|---------|-----------|-----------|
|                           | [Dollars in millions] |        |        |        |        |        |        |        |         |           |           |
| South.....                | 3,691                 | 4,496  | 6,987  | 9,292  | 12,948 | 15,938 | 15,389 | 17,696 | 16,219  | 21,833    | 24,260    |
| South Atlantic.....       | 2,012                 | 2,592  | 4,012  | 5,000  | 7,338  | 8,811  | 8,136  | (S)    | 9,394   | 12,885    | 14,167    |
| Delaware.....             | (T)                   | (T)    | (T)    | (T)    | (D)    | (D)    | (D)    | (D)    | 913 (S) | 1,077 (S) | 1,009 (S) |
| Maryland.....             | 382                   | 424    | (T)    | (T)    | 1,548  | 1,292  | 1,093  | 1,376  | 1,296   | 1,075     | 1,425     |
| District of Columbia..... | 8                     | 33     | (T)    | (T)    | (D)    | (D)    | (D)    | 46     | 515 (S) | 672 (S)   | (D)       |
| Virginia.....             | 318                   | 464    | 539    | 941    | 862    | 1,284  | 1,131  | 1,275  | 1,046   | 1,577     | 1,767     |
| West Virginia.....        | (T)                   | (T)    | (T)    | (T)    | (D)    | 83     | (D)    | (D)    | 100 (S) | 243       | (D)       |
| North Carolina.....       | 268                   | 327    | 546    | 786    | (D)    | 1,666  | 1,311  | 1,470  | 1,886   | 2,226     | 3,590     |
| South Carolina.....       | 96                    | 82     | (T)    | (T)    | (D)    | 500    | 388    | 479    | 461     | 739       | 783 (S)   |
| Georgia.....              | 99                    | 147    | 220    | 348    | (D)    | 958    | 722    | 993    | 792     | 1,175     | 1,273     |
| Florida.....              | 462                   | 620    | 1,449  | (T)    | 1,973  | 2,041  | 2,352  | (S)    | 2,386   | 4,101     | 3,442     |
| East South Central.....   | 467                   | 402    | 624    | 1,007  | 1,302  | 2,425  | 1,647  | 1,662  | 1,678   | 2,207     | 2,110     |
| Kentucky.....             | 100                   | 209    | 170    | 191    | (D)    | 238    | 227    | 176    | 282     | 452       | 359       |
| Tennessee.....            | 306                   | (T)    | (T)    | (T)    | (D)    | 621    | 934    | 843    | 788     | 1,003     | 1,089     |
| Alabama.....              | 48                    | 62     | 100    | 187    | (S)    | 1,523  | 430    | 596    | 557 (S) | 686       | 589 (S)   |
| Mississippi.....          | 13                    | (T)    | (T)    | (T)    | 62     | 42     | 56     | (S)    | 51      | 66        | 73        |
| West South Central.....   | 1,212                 | 1,502  | 2,351  | 3,285  | 4,307  | 4,702  | 5,605  | 6,205  | 5,146   | 6,741     | 7,983     |
| Arkansas.....             | 10                    | 11     | 52     | (T)    | (D)    | 129    | 51     | (S)    | 179     | 181       | 118       |
| Louisiana.....            | 106                   | 83     | 158    | 257    | (D)    | 128    | 169    | (S)    | 106     | 61        | 172       |
| Oklahoma.....             | 142                   | 174    | 339    | 407    | (D)    | 367    | 333    | 448    | 299     | 288       | 428       |
| Texas.....                | 954                   | 1,233  | (T)    | (T)    | 3,762  | 4,077  | 5,051  | 5,439  | 4,562   | 6,211 (S) | 7,265     |
| West.....                 | 7,379                 | 10,176 | 11,873 | 17,843 | 25,570 | 26,207 | 30,998 | (S)    | 32,300  | 40,465    | 49,954    |
| Mountain.....             | 1,034                 | 1,139  | 2,135  | 2,845  | 3,766  | 4,272  | 4,113  | 5,931  | 5,026   | 6,676     | 8,120     |
| Montana.....              | (T)                   | (T)    | (T)    | (T)    | (D)    | 7      | (D)    | (S)    | (D)     | 17        | 92        |
| Idaho.....                | (T)                   | (T)    | (T)    | (T)    | 451    | 467    | (D)    | (S)    | 686     | 827       | 1,181 (S) |
| Wyoming.....              | (T)                   | (T)    | (T)    | 2      | 3      | 4      | (D)    | 2      | 15      | 25        | 28        |
| Colorado.....             | 257                   | 269    | 529    | 741    | 988    | 1,207  | 1,167  | (S)    | 1,966   | 1,865     | 2,248     |
| New Mexico.....           | (T)                   | (T)    | (T)    | (T)    | (D)    | 950    | 1,039  | 1,217  | (D)     | 1,461     | 1,310 (S) |
| Arizona.....              | 200                   | 372    | 758    | (T)    | 1,079  | 809    | 921    | 1,080  | 1,039   | 1,356 (S) | 1,854     |
| Utah.....                 | 132                   | 142    | 265    | 242    | (D)    | 774    | 389    | 407    | 279     | 803       | 1,027     |
| Nevada.....               | 72                    | (T)    | (T)    | (T)    | (S)    | 55     | 29     | 95     | 65      | 322       | 380       |

See explanatory information and SOURCE at end of table.

**Table A-48. Total (company, Federal, and other) funds for industrial R&D performance in selected years by state: 1977-97**

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| Area                      | 1977                  | 1979  | 1981  | 1983   | 1985   | 1987   | 1989   | 1991  | 1993      | 1995      | 1997      |
|---------------------------|-----------------------|-------|-------|--------|--------|--------|--------|-------|-----------|-----------|-----------|
|                           | [Dollars in millions] |       |       |        |        |        |        |       |           |           |           |
| Pacific.....              | 6,345                 | 9,037 | 9,738 | 14,998 | 21,804 | 21,935 | 26,884 | (S)   | 27,274    | 33,789    | 41,834    |
| Washington.....           | 681                   | (T)   | (T)   | (T)    | 2,351  | 2,939  | 2,728  | 3,677 | 4,575 (S) | 4,294 (S) | 6,610 (S) |
| Oregon.....               | 77                    | 116   | (T)   | (T)    | (D)    | 281    | 357    | (S)   | 455       | 741       | 1,102     |
| California.....           | 5,600                 | 7,437 | 7,626 | (T)    | (S)    | 18,636 | 23,781 | (S)   | 21,975    | 28,710    | 34,011    |
| Alaska.....               | (T)                   | (T)   | (T)   | (T)    | (D)    | 10     | 9      | 21    | 14        | 30        | 24 (S)    |
| Hawaii.....               | (T)                   | (T)   | (T)   | (T)    | 13     | 70     | 9      | 13    | 255       | 14        | 87        |
| Undistributed funds ..... | 2,291                 | 3,245 | (T)   | 3,931  | 1,495  | 2,281  | 2,945  | 772   | 683       | 1,773 (S) | 7,211 (S) |

**KEY:** (D) = Data have been withheld to avoid disclosing information about individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

(T) = Data are not separately available but included in total.

**NOTES:** The 1993 data collected during the 1995 survey includes respondent revisions for both total R&D and state R&D allocations. Companies new to the survey may not have reported data by state on the report form they received and may not have 1993 state data on their 1995 form. For companies such as these, 1993 state data were allocated to the state in which the company's headquarters was located.



As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-49. Total (company, Federal, and other) funds for industrial R&D performance,  
by state and source of funds: 1997**

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| Area                      | Total                 | Federal   | Company |
|---------------------------|-----------------------|-----------|---------|
|                           | [Dollars in millions] |           |         |
| United States .....       | 157,539               | 23,928    | 133,611 |
| Alabama.....              | 589 (S)               | 189 (S)   | 399     |
| Alaska.....               | 24 (S)                | (D)       | (D)     |
| Arizona.....              | 1,854                 | 677 (S)   | 1,177   |
| Arkansas.....             | 118                   | (D)       | (D)     |
| California.....           | 34,011                | 5,977 (S) | 28,034  |
| Colorado.....             | 2,248                 | 525       | 1,723   |
| Connecticut.....          | 3,014                 | 307       | 2,707   |
| Delaware.....             | 1,009 (S)             | 8         | 1,001   |
| District of Columbia..... | (D)                   | (D)       | (D)     |
| Florida.....              | 3,442                 | 1,461     | 1,981   |
| Georgia.....              | 1,273                 | 212       | 1,062   |
| Hawaii.....               | 87                    | 55        | 32      |
| Idaho.....                | 1,181 (S)             | (D)       | (D)     |
| Illinois.....             | 6,248                 | 163 (S)   | 6,085   |
| Indiana.....              | 2,677                 | (D)       | (D)     |
| Iowa.....                 | 578                   | (D)       | (D)     |
| Kansas.....               | 1,136 (S)             | (D)       | (D)     |
| Kentucky.....             | 359                   | 3 (S)     | 356     |
| Louisiana.....            | 172                   | (D)       | (D)     |
| Maine.....                | 83                    | (D)       | (D)     |
| Maryland.....             | 1,425                 | 456       | 970     |
| Massachusetts.....        | 8,300                 | 1,397 (S) | 6,903   |
| Michigan.....             | 13,009                | 121       | 12,888  |
| Minnesota.....            | 3,116                 | 362 (S)   | 2,754   |
| Mississippi.....          | 73                    | (D)       | (D)     |
| Missouri.....             | 1,290 (S)             | 30        | 1,260   |
| Montana.....              | 92                    | (D)       | (D)     |
| Nebraska.....             | 71                    | (D)       | (D)     |
| Nevada.....               | 380                   | (D)       | (D)     |
| New Hampshire.....        | 652                   | (D)       | (D)     |
| New Jersey.....           | 11,069                | 117       | 10,952  |
| New Mexico.....           | 1,310 (S)             | (D)       | (D)     |
| New York.....             | 9,939 (S)             | 2,078 (S) | 7,861   |
| North Carolina.....       | 3,590                 | 111       | 3,478   |
| North Dakota.....         | 33                    | 0         | 33      |
| Ohio.....                 | 5,608                 | 604 (S)   | 5,004   |
| Oklahoma.....             | 428                   | 45        | 383     |
| Oregon.....               | 1,102                 | 28 (S)    | 1,075   |
| Pennsylvania.....         | 6,609 (S)             | 672 (S)   | 5,937   |
| Rhode Island.....         | 704 (S)               | (D)       | (D)     |

See explanatory information and SOURCE at end of table.

**Table A-49. Total (company, Federal, and other) funds for industrial R&D performance,  
by state and source of funds: 1997**

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| Area                     | Total                 | Federal   | Company |
|--------------------------|-----------------------|-----------|---------|
|                          | [Dollars in millions] |           |         |
| South Carolina.....      | 783 (S)               | 83 (S)    | 700     |
| South Dakota.....        | 26                    | 0         | 26      |
| Tennessee.....           | 1,089                 | (D)       | (D)     |
| Texas.....               | 7,265                 | 784       | 6,481   |
| Utah.....                | 1,027                 | 199 (S)   | 829     |
| Vermont.....             | 246                   | (D)       | (D)     |
| Virginia.....            | 1,767                 | 851       | 916     |
| Washington.....          | 6,610 (S)             | (D)       | (D)     |
| West Virginia.....       | (D)                   | (D)       | (D)     |
| Wisconsin.....           | 1,707                 | 29        | 1,678   |
| Wyoming.....             | 28                    | 0         | 28      |
| Undistributed funds..... | 7,211 (S)             | 1,056 (S) | 6,154   |

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-50. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company, for the U.S. and top 10 R&amp;D-performing states: 1997

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| Industry and size of company                    | SIC code           | U.S.<br>total         | Top 10 states |          |            |           |                    |         |                 |                   |          |         | All other<br>states plus<br>undistributed |
|---|--------------------|-----------------------|---------------|----------|------------|-----------|--------------------|---------|-----------------|-------------------|----------|---------|---|
|   |                    |                       | California    | Michigan | New Jersey | New York  | Massa-<br>chusetts | Texas   | Wash-<br>ington | Penn-<br>sylvania | Illinois | Ohio    |   |
|   |                    | [Dollars in millions] |               |          |            |           |                    |         |                 |                   |          |         |   |
| All Industries.....                             |                    | 157,539               | 34,011        | 13,009   | 11,069     | 9,939 (S) | 8,300              | 7,265   | 6,610 (S)       | 6,609 (S)         | 6,248    | 5,608   | 48,871                                    |
| Distribution by industry:                       |                    |                       |               |          |            |           |                    |         |                 |                   |          |         |   |
| Manufacturing.....                              |                    | 121,025               | 24,488        | 12,532   | 8,180      | 7,503     | 5,194              | 5,912   | 4,330 (S)       | 5,396             | 5,835    | 4,296   | 37,358                                    |
| Food, kindred, and tobacco products .....       | 20,21              | 1,787                 | 39            | (D)      | 187        | 40        | (D)                | 29      | (D)             | 52                | 295      | 39      | 998                                       |
| Textiles and apparel.....                       | 22,23              | (D)                   | (D)           | 3        | (D)        | 26        | 23                 | 10 (S)  | 0               | (D)               | 0        | (D)     | 397                                       |
| Lumber, wood products, and furniture.....       | 24,25              | 348                   | 35            | 75       | 37         | (D)       | 0                  | 1       | (D)             | (D)               | 3        | 5       | 179                                       |
| Paper and allied products.....                  | 26                 | (D)                   | (D)           | (D)      | (D)        | 63        | 24                 | (D)     | (D)             | 17                | 48       | 26      | 1,123                                     |
| Chemicals and allied products.....              | 28                 | (D)                   | 1,674         | 1,003    | 3,543      | 902       | 429                | 453     | (D)             | 2,388             | 1,378    | 981     | 6,216                                     |
| Industrial chemicals.....                       | 281-82,286         | (D)                   | (D)           | (D)      | 552 (S)    | 89 (S)    | (D)                | 284 (S) | (D)             | 877               | (D)      | 157 (S) | 2,441                                     |
| Drugs and medicines.....                        | 283                | 11,589                | 1,285         | (D)      | 2,746      | 504       | 252                | 139     | (D)             | 1,409             | (D)      | (D)     | 3,321                                     |
| Other chemicals.....                            | 284-85,287-89      | (D)                   | (D)           | 70       | 245        | 308 (S)   | (D)                | 30      | (D)             | 102               | 85 (S)   | (D)     | 454                                       |
| Petroleum refining and extraction.....          | 13,29              | (D)                   | (D)           | (D)      | (D)        | 21        | (D)                | 422     | 0               | 56                | (D)      | (D)     | 393                                       |
| Rubber products.....                            | 30                 | (D)                   | 130           | 46       | 21         | 65        | 73                 | 23      | (D)             | 53                | 31       | 461 (S) | 480                                       |
| Stone, clay, and glass products.....            | 32                 | 608                   | 10            | (D)      | 0          | (D)       | (D)                | (D)     | 0               | 156               | 22 (S)   | 126     | 98  |
| Primary metals.....                             | 33                 | 988                   | (D)           | 28       | 25 (S)     | 30 (S)    | (D)                | 65 (S)  | (D)             | 170 (S)           | (D)      | 99      | 408                                       |
| Ferrous metals and products.....                | 331-32,<br>3398-99 | (D)                   | (D)           | 18       | (D)        | (D)       | (D)                | (D)     | 0               | (D)               | (D)      | (D)     | 281                                       |
| Nonferrous metals and products.....             | 333-36             | (D)                   | (D)           | 11       | (D)        | (D)       | (D)                | (D)     | (D)             | (D)               | (D)      | (D)     | 127                                       |
| Fabricated metal products.....                  | 34                 | 1,798                 | 326           | 66       | 14         | 35        | 204                | 28      | 10              | 257               | 83       | 146     | 628                                       |
| Machinery.....                                  | 35                 | 18,499                | 5,818         | 989      | (D)        | 1,485     | 656                | 1,153   | (D)             | 381               | 716      | 369     | 5,618                                     |
| Office, computing, and accounting machines..... | 357                | 12,840                | 4,838         | 317      | (D)        | (D)       | 594                | (D)     | (D)             | 90                | 22 (S)   | (D)     | 3,525                                     |
| Other machinery, except electrical.....         | 351-56,358-59      | 5,659                 | 980           | 671      | 97         | (D)       | 61                 | (D)     | (D)             | 291               | 694      | (D)     | 2,094                                     |

See explanatory information and SOURCE at end of table.

Table A-50. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company, for the U.S. and top 10 R&amp;D-performing states: 1997

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| Industry and size of company                                | SIC code    | U.S.<br>total | Top 10 states |          |            |          |                    |           |                 |                   |          |       | All other<br>states plus<br>undistributed |
|---|-------------|---------------|---------------|----------|------------|----------|--------------------|-----------|-----------------|-------------------|----------|-------|---|
|   |             |               | California    | Michigan | New Jersey | New York | Massa-<br>chusetts | Texas     | Wash-<br>ington | Penn-<br>sylvania | Illinois | Ohio  |   |
| [Dollars in millions]                                       |             |               |               |          |            |          |                    |           |                 |                   |          |       |   |
| Distribution by industry:                                   |             |               |               |          |            |          |                    |           |                 |                   |          |       |   |
| Electrical equipment.....                                   | 36          | 24,585        | 7,480         | (D)      | 1,468      | 727      | 1,715              | 2,805 (S) | (D)             | 647               | 2,398    | 866   | 6,128                                     |
| Radio and TV receiving equipment.....                       | 365         | (D)           | 48            | (D)      | (D)        | (D)      | (D)                | 0         | (D)             | (D)               | (D)      | 0     | 11  |
| Communication equipment.....                                | 366         | (D)           | 1,248         | (D)      | (D)        | 225      | 486                | 953       | (D)             | 387               | (D)      | 144   | 2,021                                     |
| Electronic components.....                                  | 367         | (D)           | 5,164 (S)     | 18       | 45         | (D)      | 824                | 1,742 (S) | 6               | (D)               | (D)      | 8     | 2,418                                     |
| Other electrical equipment.....                             | 361-64,369  | 4,909         | 1,021         | 135      | 171 (S)    | 393      | (D)                | 110       | (D)             | 112               | 245      | 714   | 1,678                                     |
| Transportation equipment.....                               | 37          | 31,993        | 4,225 (S)     | 9,623    | 25         | (D)      | 29                 | (D)       | (D)             | 401 (S)           | 144      | 722   | 10,173                                    |
| Motor vehicles and motor vehicles equipment.....            | 371         | (D)           | (D)           | (D)      | (D)        | 36       | (D)                | (D)       | (D)             | 41                | 75       | (D)   | 2,439                                     |
| Other transportation equipment.....                         | 373-75,379  | (D)           | (D)           | (D)      | (D)        | (D)      | 0                  | 0         | (D)             | (D)               | (D)      | (D)   | 320                                       |
| Aircraft and missiles.....                                  | 372,376     | 16,296        | (D)           | 179      | 22         | (D)      | (D)                | (D)       | (D)             | (D)               | (D)      | (D)   | 7,413                                     |
| Professional and scientific instruments.....                | 38          | 13,458        | 3,795         | 123      | 1,194      | 1,265    | 1,782 (S)          | 89        | 180             | 651               | 365 (S)  | 204   | 3,811                                     |
| Scientific and mechanical measuring instruments.....        | 381-82      | 8,135         | 3,318         | (D)      | (D)        | (D)      | 1,369 (S)          | 25        | (D)             | (D)               | (D)      | 177   | 2,686                                     |
| Optical, surgical, photographic, and other instruments..... | 384-87      | 5,323         | 477           | (D)      | (D)        | (D)      | 413                | 63        | (D)             | (D)               | (D)      | 27    | 1,124                                     |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39    | 2,798         | 626           | 249      | 89         | 95       | 222                | 128       | 57              | 154               | 239      | 231   | 709                                       |
| Nonmanufacturing .....                                      |             | 36,514        | 9,523         | 477      | 2,888      | 2,435    | 3,106              | 1,353     | 2,281           | 1,212             | 413      | 1,311 | 11,513                                    |
| Transportation and utilities.....                           | 40-42,44-49 | 3,013         | 110           | (D)      | (D)        | 93       | (D)                | (D)       | 0               | 28                | 14       | 498   | 1,101                                     |
| Communications.....   | 48          | (D)           | 46            | 0        | (D)        | (D)      | (D)                | (D)       | 0               | 14                | 0        | (D)   | 801                                       |
| Telephone communications.....                               | 481         | (D)           | (D)           | 0        | (D)        | (D)      | (D)                | (D)       | 0               | (D)               | 0        | (D)   | 777                                       |
| Other communications.....                                   | 482-484,489 | 58            | (D)           | 0        | 4          | (D)      | (D)                | (D)       | 0               | (D)               | 0        | 0     | 24  |

See explanatory information and SOURCE at end of table.

Table A-50. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company, for the U.S. and top 10 R&amp;D-performing states: 1997

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| Industry and size of company  | SIC code                            | U.S.<br>total | Top 10 states |          |            |          |                    |        |                 |                   |          |      | All other<br>states plus<br>undistributed |
|---|-------------------------------------|---------------|---------------|----------|------------|----------|--------------------|--------|-----------------|-------------------|----------|------|---|
|   |                                     |               | California    | Michigan | New Jersey | New York | Massa-<br>chusetts | Texas  | Wash-<br>ington | Penn-<br>sylvania | Illinois | Ohio |   |
| [Dollars in millions]   |                                     |               |               |          |            |          |                    |        |                 |                   |          |      |   |
| Distribution by industry:   |                                     |               |               |          |            |          |                    |        |                 |                   |          |      |   |
| Electric, gas, and sanitary services.....                                       | 49                                  | (D)           | 39            | (D)      | 4          | 44       | 12                 | 16 (S) | 0               | (D)               | (D)      | (D)  | 100                                       |
| Other transportation and utilities.....   | 40-42,44-47                         | (D)           | 24            | (D)      | (D)        | (D)      | 0                  | (D)    | 0               | (D)               | (D)      | 454  | 200                                       |
| Trade.....  | 50-59                               | (D)           | 2,348         | (D)      | 715        | 919      | 1,102              | 421    | 31              | 131               | 46       | 71   | 2,190                                     |
| Finance, insurance, and real estate.....  | 60-65,67                            | (D)           | 53            | (D)      | (D)        | 299      | (D)                | (D)    | 0               | (D)               | 91       | (D)  | 889                                       |
| Services.....   | 701,72,73,<br>75-81,83,84,<br>87,89 | 22,400        | 6,561         | 398      | 1,214      | 1,016    | 1,766              | 751    | 2,210           | 955               | 214      | 596  | 6,720                                     |
| Business services.....  | 73                                  | 11,960        | 3,350         | 201 (S)  | 855        | 616      | 790                | 530    | 1,893           | 227               | 117      | 127  | 3,254                                     |
| Computer and data processing services.....                                      | 737                                 | 11,706        | 3,304         | (D)      | (D)        | 593      | (D)                | (D)    | (D)             | 216               | 100      | (D)  | 3,148                                     |
| Other business services.....  | 731-736,738                         | 254           | 45            | (D)      | (D)        | 23       | (D)                | (D)    | (D)             | 11                | 17       | (D)  | 106                                       |
| Health services.....  | 80                                  | (D)           | 37            | 0        | (D)        | (D)      | 0                  | 0      | (D)             | (D)               | (D)      | 0    | 71  |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                         | (D)           | (D)           | 0        | (D)        | (D)      | 0                  | 0      | 0               | (D)               | 15       | 0    | 36  |
| Other health services.....  | 802-805,<br>808-809                 | 49            | (D)           | 0        | (D)        | 0        | 0                  | 0      | (D)             | 0                 | (D)      | 0    | 35  |
| Engineering and management services.....  | 87                                  | 9,290         | 2,872         | 195      | 329        | 393      | (D)                | 220    | 315             | (D)               | 76       | 462  | 3,254                                     |
| Engineering, architectural, and surveying.....                                  | 871                                 | 2,039         | 323           | 58       | 59         | 64       | (D)                | (D)    | (D)             | 21                | 17       | 107  | 1,142                                     |
| Research, development, and testing.....   | 873                                 | (D)           | 2,527         | 136      | 270        | 149      | 856                | 113    | 247             | 178               | (D)      | 355  | 2,002                                     |
| Other engineering and management services.....                                  | 872,874                             | (D)           | 21            | 1        | 0          | 180      | (D)                | (D)    | (D)             | (D)               | 5        | 0    | 110                                       |

See explanatory information and SOURCE at end of table.

Table A-50. Total (company, Federal, and other) funds for industrial R&amp;D performance, by industry and size of company, for the U.S. and top 10 R&amp;D-performing states: 1997

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| Industry and size of company                              | SIC code                          | U.S.<br>total | Top 10 states |          |            |          |                    |           |                 |                   |          |       | All other<br>states plus<br>undistributed |
|---|-----------------------------------|---------------|---------------|----------|------------|----------|--------------------|-----------|-----------------|-------------------|----------|-------|---|
|   |                                   |               | California    | Michigan | New Jersey | New York | Massa-<br>chusetts | Texas     | Wash-<br>ington | Penn-<br>sylvania | Illinois | Ohio  |   |
| [Dollars in millions]                                     |                                   |               |               |          |            |          |                    |           |                 |                   |          |       |   |
| Distribution by industry:                                 |                                   |               |               |          |            |          |                    |           |                 |                   |          |       |   |
| Other services.....                                       | 701, 72, 75-79,<br>81, 83, 84, 89 | (D)           | 302           | 2        | (D)        | (D)      | (D)                | 0         | (D)             | (D)               | (D)      | 6     | 141                                       |
| Other nonmanufacturing industries <sup>1</sup> .....      | 07-12, 14, 15,<br>161-162, 17     | 1,618         | 452           | 68       | 34         | 108      | 5                  | (D)       | 40              | (D)               | 49       | (D)   | 613                                       |
| Distribution by size of company:<br>[Number of employees] |                                   |               |               |          |            |          |                    |           |                 |                   |          |       |   |
| Total.....  |                                   | 157,539       | 34,011        | 13,009   | 11,069     | 9,939    | 8,300              | 7,265     | 6,610 (S)       | 6,609             | 6,248    | 5,608 | 48,871                                    |
| Fewer than 500.....                                       |                                   | 24,063        | 7,367         | 1,351    | 1,255      | 1,023    | 2,018              | 868       | 613             | 774               | 517      | 758   | 7,516                                     |
| 500 to 999.....   |                                   | 4,966         | 1,341         | 95       | 156        | 205      | 469                | 132       | 69              | 83                | 225      | 280   | 1,912                                     |
| 1,000 to 4,999.....                                       |                                   | 19,590        | 5,238         | 637 (S)  | 893        | 1,369    | 1,105              | 784       | 234             | 1,244             | 669      | 517   | 6,899                                     |
| 5,000 to 9,999.....                                       |                                   | 14,266        | 3,268         | 656      | 1,905      | 614 (S)  | 757                | 775       | (D)             | 403               | 285      | (D)   | 4,853                                     |
| 10,000 to 24,999.....                                     |                                   | 21,510        | 2,708         | 650      | 2,324      | 821      | 1,439              | 1,976 (S) | (D)             | 1,672             | 646 (S)  | (D)   | 6,682                                     |
| 25,000 or more.....                                       |                                   | 73,144        | 14,089        | 9,619    | 4,535      | 5,907    | 2,511 (S)          | 2,730     | (D)             | 2,433             | 3,907    | (D)   | 21,010                                    |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-51. Total (company, Federal, and other) funds for industrial R&D performance, by industry,  
size of company, and type of cost: 1997**

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| Industry and size of company                                   | SIC code       | Total<br>R&D<br>costs | Wages of<br>R&D<br>personnel | Materials<br>and<br>supplies | Other<br>costs |
|--|----------------|-----------------------|------------------------------|------------------------------|----------------|
|  |                | [Dollars in millions] | [Percent]                    |                              |                |
| All Industries.....  |                | 157,539               | 47.0                         | 17.5                         | 35.5           |
| Distribution by industry                                       |                |                       |                              |                              |                |
| Manufacturing.....   |                | 121,025               | 45.5                         | 18.9                         | 35.6           |
| Food, kindred, and tobacco product .....                       | 20,21          | 1,787                 | 48.2                         | 11.1                         | 40.7           |
| Textiles and apparel.....                                      | 22,23          | (D)                   | 48.5                         | 23.2 (S)                     | 28.3           |
| Lumber, wood products, and furniture.....                      | 24,25          | 348                   | 55.9                         | 27.1                         | 17.0           |
| Paper and allied products.....                                 | 26             | (D)                   | 48.4 (S)                     | 14.6 (S)                     | 37.0           |
| Chemicals and allied products.....                             | 28             | (D)                   | 42.0                         | 12.1                         | 45.9           |
| Industrial chemicals.....                                      | 281-82,286     | (D)                   | 48.8                         | 13.1 (S)                     | 38.1           |
| Drugs and medicines.....                                       | 283            | 11,589                | 38.8                         | 12.2                         | 49.0           |
| Other chemicals.....   | 284-85,287-89  | (D)                   | 42.8                         | 8.8                          | 48.4           |
| Petroleum refining and extraction.....                         | 13,29          | (D)                   | 43.2                         | 11.8                         | 45.0           |
| Rubber products.....   | 30             | (D)                   | 45.9                         | 21.5                         | 32.6           |
| Stone, clay, and glass products.....                           | 32             | 608                   | 41.0                         | 13.7                         | 45.3           |
| Primary metals.....  | 33             | 988                   | 51.9                         | 16.6                         | 31.5           |
| Ferrous metals and products.....                               | 331-32,3398-99 | (D)                   | 54.0                         | 10.2                         | 35.8           |
| Nonferrous metals and products.....                            | 333-36         | (D)                   | 50.3 (S)                     | 25.0                         | 24.7           |
| Fabricated metal products.....                                 | 34             | 1,798                 | 49.9                         | 17.5                         | 32.6           |
| Machinery.....   | 35             | 18,499                | 50.6                         | 16.5                         | 32.9           |
| Office, computing, and accounting machines.....                | 357            | 12,840                | 51.5                         | 13.3                         | 35.2           |
| Other machinery, except electrical.....                        | 351-56,358-59  | 5,659                 | 48.6                         | 24.5                         | 26.9           |
| Electrical equipment.....                                      | 36             | 24,585                | 49.0                         | 21.0                         | 30.0           |
| Radio and TV receiving equipment.....                          | 365            | (D)                   | 51.0                         | 13.7                         | 35.3           |
| Communication equipment.....                                   | 366            | (D)                   | 50.5                         | 31.6                         | 17.9           |
| Electronic components.....                                     | 367            | (D)                   | 50.4                         | 15.8                         | 33.8 (S)       |
| Other electrical equipment.....                                | 361-64,369     | 4,909                 | 43.1                         | 16.1                         | 40.8           |
| Transportation equipment.....                                  | 37             | 31,993                | 38.2 (S)                     | 25.9                         | 35.9           |
| Motor vehicles and motor vehicles equipment.....               | 371            | (D)                   | 38.5                         | 30.3                         | 31.2           |
| Other transportation equipment.....                            | 373-75,379     | (D)                   | 51.8                         | 20.8 (S)                     | 27.5           |
| Aircraft and missiles.....                                     | 372,376        | 16,296                | 38.4 (S)                     | 22.4 (S)                     | 39.2           |
| Professional and scientific instruments.....                   | 38             | 13,458                | 54.0                         | 13.5                         | 32.5           |
| Scientific and mechanical measuring instruments....            | 381-82         | 8,135                 | 54.2                         | 12.5                         | 33.3           |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87         | 5,323                 | 53.6                         | 15.0                         | 31.4           |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39       | 2,798                 | 81.2                         | 8.9                          | 9.9            |
| Nonmanufacturing .....   |                | 36,514                | 55.4                         | 10.9                         | 33.7           |
| Transportation and utilities.....                              | 40-42,44-49    | 3,013                 | 50.9                         | 8.9                          | 40.2           |
| Communications.....  | 48             | (D)                   | 49.5                         | 7.9                          | 42.6           |
| Telephone communications.....                                  | 481            | (D)                   | 49.6                         | 7.9                          | 42.5           |
| Other communications.....                                      | 482-484,489    | 58                    | 52.5                         | 3.8                          | 43.7           |

See explanatory information and SOURCE at end of table.

**Table A-51. Total (company, Federal, and other) funds for industrial R&D performance, by industry, size of company, and type of cost: 1997**

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| Industry and size of company   | SIC code                        | Total<br>R&D<br>costs | Wages of<br>R&D<br>personnel | Materials<br>and<br>supplies | Other<br>costs |
|--|---------------------------------|-----------------------|------------------------------|------------------------------|----------------|
|  |                                 | [Dollars in millions] | [Percent]                    |                              |                |
| <b>Distribution by industry</b>  |                                 |                       |                              |                              |                |
| Electric, gas, and sanitary services.....  | 49                              | (D)                   | 37.1                         | 19.4                         | 43.5           |
| Other transportation and utilities.....  | 40-42,44-47                     | (D)                   | 81.6                         | 4.7 (S)                      | 13.7           |
| Trade.....   | 50-59                           | (D)                   | 58.7                         | 10.7                         | 30.6 (S)       |
| Finance, insurance, and real estate.....   | 60-65,67                        | (D)                   | 70.9                         | 9.1                          | 20.0           |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 22,400                | 53.1                         | 11.6                         | 35.3           |
| Business services.....   | 73                              | 11,960                | 60.4                         | 6.1                          | 33.5           |
| Computer and data processing services.....   | 737                             | 11,706                | 60.5                         | 6.1                          | 33.4           |
| Other business services.....   | 731-736,738                     | 254                   | 56.9                         | 5.1                          | 38.0           |
| Health services.....   | 80                              | (D)                   | 49.7                         | 28.6                         | 21.7           |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | (D)                   | 50.4                         | 29.8                         | 19.8           |
| Other health services.....   | 802-805,808-809                 | 49                    | 40.0                         | 10.6                         | 49.4           |
| Engineering and management services.....   | 87                              | 9,290                 | 43.2                         | 17.4                         | 39.4           |
| Engineering, architectural, and surveying.....                                     | 871                             | 2,039                 | 51.9                         | 14.1                         | 34.0           |
| Research, development, and testing.....  | 873                             | (D)                   | 39.7                         | 18.8                         | 41.5           |
| Other engineering and management services....                                      | 872,874                         | (D)                   | 87.7                         | 0.2 (S)                      | 12.1           |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | (D)                   | 80.3                         | 2.9                          | 16.8           |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,                    | 1,618                 | 85.0                         | 4.4                          | 10.6           |
| <b>Distribution by size of company:</b>  |                                 |                       |                              |                              |                |
| [Number of employees]  |                                 |                       |                              |                              |                |
| Total.....   |                                 | 157,539               | 47.0                         | 17.5                         | 35.5           |
| Fewer than 500.....  |                                 | 24,061                | 70.0                         | 8.7                          | 21.3           |
| 500 to 999.....  |                                 | 4,966                 | 50.6                         | 14.8                         | 34.6           |
| 1,000 to 4,999.....  |                                 | 19,590                | 50.3                         | 13.0                         | 36.7           |
| 5,000 to 9,999.....  |                                 | 14,266                | 49.5                         | 16.2                         | 34.3           |
| 10,000 to 24,999.....  |                                 | 21,510                | 48.0                         | 14.4                         | 37.6           |
| 25,000 or more.....  |                                 | 73,144                | 44.1                         | 20.5                         | 35.4           |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.  
(S) = Indicates imputation of more than 50 percent.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-52. Number of full-time-equivalent (FTE) R&amp;D scientists and engineers in R&amp;D-performing companies, by industry and size of company: 1987-98

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| Industry and size of company                      | SIC code       | 1987           | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994     | 1995     | 1996     | 1997      | 1998      |
|---|----------------|----------------|-------|-------|-------|-------|-------|-------|----------|----------|----------|-----------|-----------|
|   |                | [In thousands] |       |       |       |       |       |       |          |          |          |           |           |
| Total (January).....                              |                | 695.8          | 708.6 | 722.5 | 743.6 | 773.4 | 779.3 | 764.7 | 768.5    | 746.1    | 832.8    | 885.7     | 951.5     |
| Total (Annual average).....                       |                | 702.2          | 715.6 | 733.0 | 758.5 | 776.4 | 772.0 | 766.6 | 757.3    | 789.4    | 859.3    | 918.6     | NA        |
| All Industries.....                               |                | 695.8          | 708.6 | 722.5 | 743.6 | 773.4 | 779.3 | 764.7 | 768.5    | 746.1    | 832.8    | 885.7     | 951.5     |
| Distribution by industry:                         |                |                |       |       |       |       |       |       |          |          |          |           |           |
| Manufacturing.....                                |                | 599.4          | 606.7 | 597.3 | NA    | NA    | 576.7 | 568.2 | 571.1    | 547.2    | 606.2    | 639.9     | 682.1     |
| Food, kindred, and tobacco products.....          | 20,21          | (S)            | (S)   | (S)   | (S)   | 9.4   | 9.8   | 9.6   | 10.3     | 8.9      | 9.8      | 10.4      | 11.0      |
| Textiles and apparel.....                         | 22,23          | 2.4            | 2.4   | 2.5   | 2.8   | (S)   | 2.8   | 3.1   | 3.3      | 2.9      | 3.8      | 3.7       | 3.2       |
| Lumber, wood products, and furniture.....         | 24,25          | 1.3            | 1.3   | 1.4   | (S)   | (S)   | 1.5   | 1.6   | 3.3      | 2.3      | 2.9      | 3.4       | 3.6       |
| Paper and allied products.....                    | 26             | 6.0            | 6.1   | 6.4   | 8.5   | (S)   | 10.7  | 10.6  | 10.6     | 10.6     | 11.0 (S) | 11.2 (S)  | 10.4 (S)  |
| Chemicals and allied products.....                | 28             | 75.2           | 75.8  | 78.3  | 80.4  | 81.6  | 85.6  | 86.5  | 93.1     | 99.6     | 94.3     | 89.0      | 89.5      |
| Industrial chemicals.....                         | 281-82,286     | (S)            | (S)   | (S)   | (S)   | (S)   | 29.9  | 26.4  | 28.8     | 33.7     | 28.4     | 31.2      | 26.7      |
| Drugs and medicines.....                          | 283            | 32.6           | 33.0  | 34.4  | 34.3  | 35.4  | 38.7  | 42.3  | 48.5     | 50.3     | 49.0     | 43.1      | 45.3      |
| Other chemicals.....                              | 284-85,287-89  | 20.2           | 20.3  | 18.8  | 18.9  | 17.0  | 17.0  | 17.8  | 15.8     | 15.6     | 16.9     | 14.8      | 17.5      |
| Petroleum refining and extraction.....            | 13,29          | 9.9            | 9.5   | 10.7  | 11.1  | 11.4  | 11.5  | 11.0  | 9.7      | 8.4      | 8.4      | 9.0       | 7.9       |
| Rubber products.....                              | 30             | (S)            | (S)   | (S)   | (S)   | (S)   | 14.8  | 13.0  | 9.0      | 9.8      | 10.2     | 9.9       | 11.5      |
| Stone, clay, and glass products.....              | 32             | 8.6            | 8.6   | 7.6   | 7.0   | 6.0   | 5.3   | 5.1   | 4.0      | 4.3      | 3.9      | 3.7       | 3.9 (S)   |
| Primary metals.....                               | 33             | 5.5            | 5.6   | 5.5   | 5.2   | 4.6   | 5.1   | 4.6   | 5.1      | 6.5      | 4.1      | 5.5 (S)   | 6.4 (S)   |
| Ferrous metals and products.....                  | 331-32,3398-99 | (S)            | 2.3   | 2.3   | (S)   | (S)   | 1.7   | 1.6   | 2.6      | 1.9      | 1.6      | 1.6       | 4.0 (S)   |
| Nonferrous metals and products.....               | 333-36         | 3.4            | 3.3   | 3.3   | 3.3   | 3.0   | (S)   | (S)   | 2.5      | 4.6      | 2.5      | 3.9 (S)   | 2.5       |
| Fabricated metal products.....                    | 34             | 9.9            | 10.5  | 9.9   | 10.1  | (S)   | 8.7   | 7.9   | 10.2     | 9.2      | 9.1      | 10.0      | 12.8      |
| Machinery.....                                    | 35             | 95.8           | 98.4  | 100.4 | 113.3 | 109.7 | 99.3  | 97.4  | 70.4     | 68.6     | 87.3     | 88.7      | 112.1     |
| Office, computing, and accounting machines .....  | 357            | 73.4           | 74.4  | 75.0  | 84.7  | 77.6  | 67.1  | 65.8  | 34.6     | 31.8     | 33.7     | 45.3      | 66.1      |
| Other machinery, except electrical.....           | 351-56,358-59  | 22.4           | 24.0  | 25.4  | 28.6  | 32.1  | 32.2  | 31.6  | 35.8     | 36.8     | 53.6     | 43.4      | 46.0      |
| Electrical equipment.....                         | 36             | 130.4          | 132.5 | 122.5 | 105.2 | 95.9  | 91.9  | 89.2  | 96.5     | 103.3    | 125.8    | 135.9     | 171.6     |
| Radio and TV receiving equipment.....             | 365            | 1.2            | 1.3   | 1.5   | 0.8   | 1.0   | 1.0   | 1.0   | 0.8      | 0.9      | 1.3      | 1.6       | 1.2       |
| Communication equipment.....                      | 366            | 71.9           | 73.1  | 58.0  | 47.1  | 35.8  | 31.2  | (S)   | 36.0 (S) | 41.7 (S) | 34.7 (S) | 37.6 (S)  | 69.0      |
| Electronic components.....                        | 367            | 43.7           | 44.3  | 42.8  | (S)   | 32.6  | 28.4  | 28.9  | 40.1     | 40.8     | 64.6 (S) | 75.3 (S)  | 66.8 (S)  |
| Other electrical equipment.....                   | 361-64,369     | 13.6           | (S)   | (S)   | 21.3  | (S)   | 31.2  | 28.8  | 19.6     | 20.0     | 25.3     | 21.4      | 34.6      |
| Transportation equipment.....                     | 37             | 187.3          | 188.2 | 185.4 | 170.2 | 149.7 | 141.1 | 147.5 | 129.6    | 120.8    | 156.6    | 161.8 (S) | 144.1 (S) |
| Motor vehicles and motor vehicles equipment ..... | 371            | 46.5           | 47.3  | 45.8  | 49.4  | 45.3  | 44.5  | 45.1  | 51.0     | 51.1     | 57.0     | 63.8      | 64.1      |

See explanatory information and SOURCE at end of table.

Table A-52. Number of full-time-equivalent (FTE) R&amp;D scientists and engineers in R&amp;D-performing companies, by industry and size of company: 1987-98

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| Industry and size of company  | SIC code                        | 1987           | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994      | 1995  | 1996     | 1997     | 1998     |  |
|---|---------------------------------|----------------|-------|-------|-------|-------|-------|-------|-----------|-------|----------|----------|----------|--|
|   |                                 | [In thousands] |       |       |       |       |       |       |           |       |          |          |          |  |
| Distribution by industry:   |                                 |                |       |       |       |       |       |       |           |       |          |          |          |  |
| Other transportation equipment.....   | 373-75,379                      | (S)            | (S)   | (S)   | (S)   | (S)   | (S)   | (S)   | 5.8 (S)   | 6.2   | 4.0      | 3.4      | 3.1      |  |
| Aircraft and missiles.....  | 372,376                         | 136.3          | 136.4 | 134.8 | 115.3 | 100.2 | 92.9  | 97.9  | 72.8      | 63.5  | 95.5     | 94.6 (S) | 77.0 (S) |  |
| Professional and scientific instruments.....  | 38                              | (S)            | (S)   | (S)   | (S)   | (S)   | (S)   | (S)   | 100.6 (S) | 84.4  | 70.9 (S) | 64.3 (S) | 66.3 (S) |  |
| Scientific and mechanical<br>measuring instruments                                    | 381-82                          | (S)            | (S)   | (S)   | (S)   | (S)   | (S)   | (S)   | 66.4 (S)  | 63.2  | 48.2 (S) | 42.6 (S) | 43.7 (S) |  |
| Optical, surgical, photographic, and<br>other instruments.....                        | 384-87                          | 24.6           | 24.9  | 14.5  | 8.1   | (S)   | (S)   | 20.8  | 34.2      | 21.2  | 22.7     | 21.7     | 22.6     |  |
| Other manufacturing industries <sup>1</sup> .....                                     | 27,31,39                        | 6.3            | 6.4   | 5.4   | 5.6   | (S)   | 6.0   | 5.8   | 15.5      | 7.5   | 8.2      | 33.4     | 27.8     |  |
| Nonmanufacturing <sup>2</sup> .....   |                                 | 96.4           | 101.9 | 125.2 | (S)   | (S)   | 202.6 | 196.5 | 197.4     | 198.9 | 226.6    | 245.8    | 269.5    |  |
| Transportation and utilities.....   | 40-42,44-49                     | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 29.3     | 29.4     | 15.2     |  |
| Communications.....   | 48                              | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 25.4     | 24.7     | 8.4 (S)  |  |
| Telephone communications.....   | 481                             | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 24.7     | 23.9     | 7.8 (S)  |  |
| Other communications.....   | 482-484,489                     | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 0.8      | 0.8      | 0.6      |  |
| Electric, gas, and sanitary<br>services .....   | 49                              | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 3.2 (S)  | 4.0 (S)  | 1.1      |  |
| Other transportation and utilities.....   | 40-42,44-47                     | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 0.7      | 0.8      | 5.7      |  |
| Trade.....  | 50-59                           | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 47.5     | 39.6     | 46.4     |  |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 5.6      | 15.9     | 18.3 (S) |  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 139.6    | 143.9    | 168.7    |  |
| Business services.....  | 73                              | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 80.2     | 87.8     | 105.1    |  |
| Computer and data processing<br>services .....  | 737                             | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 77.3     | 85.1     | 102.6    |  |
| Other business services.....  | 731-736, 738                    | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 3.0      | 2.8      | 2.5      |  |
| Health services.....  | 80                              | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 5.0      | 6.6      | 4.7      |  |
| Offices and clinics of medical<br>doctors, hospitals,<br>medical and dental labs..... | 801,806,807                     | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 4.4      | 6.3      | 4.0      |  |
| Other health services.....  | 802-805,808-809                 | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA        | NA    | 0.6      | 0.3 (S)  | 0.7      |  |

See explanatory information and SOURCE at end of table.

Table A-52. Number of full-time-equivalent (FTE) R&amp;D scientists and engineers in R&amp;D-performing companies, by industry and size of company: 1987-98

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| Industry and size of company                              | SIC code                     | 1987           | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995  | 1996     | 1997      | 1998      |  |
|---|------------------------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|----------|-----------|-----------|--|
|   |                              | [In thousands] |       |       |       |       |       |       |       |       |          |           |           |  |
| Distribution by industry:                                 |                              |                |       |       |       |       |       |       |       |       |          |           |           |  |
| Engineering and management service .....                  | 87                           | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 52.9     | 45.3      | 54.5      |  |
| Engineering, architectural, and surveying .....           | 871                          | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 22.8 (S) | 18.0      | 20.9      |  |
| Research, development, and testing.....                   | 873                          | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 28.8     | 24.9      | 28.3      |  |
| Other engineering and management services.....            | 872,874                      | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 1.4      | 2.3 (S)   | 5.3       |  |
| Other services.....                                       | 701,72,75-79,81,<br>83,84,89 | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 1.5      | 4.2       | 4.4       |  |
| Other nonmanufacturing industries <sup>1</sup> .....      | 07-12,14,15,<br>161-162,17   | NA             | NA    | NA    | NA    | NA    | NA    | NA    | NA    | NA    | 4.6      | 17.0      | 20.8      |  |
| Distribution by size of company:<br>[Number of employees] |                              |                |       |       |       |       |       |       |       |       |          |           |           |  |
| Total.....  |                              | 695.8          | 708.6 | 722.5 | 743.6 | 773.4 | 779.3 | 764.7 | 768.5 | 746.1 | 832.8    | 885.7     | 951.5     |  |
| Fewer than 500.....                                       |                              | 105.2          | 109.0 | 105.4 | (S)   | (S)   | 142.1 | 125.1 | 148.6 | 139.8 | 165.1    | 177.3     | 201.8     |  |
| 500 to 999.....   |                              | 18.4           | 19.3  | 18.0  | 18.6  | 18.6  | 46.2  | 46.1  | 27.9  | 29.7  | 36.6     | 37.7      | 41.3      |  |
| 1,000 to 4,999.....                                       |                              | 76.4           | 81.9  | 76.1  | 75.4  | 79.3  | 94.2  | 99.3  | 108.9 | 110.8 | 124.4    | 131.6     | 137.8     |  |
| 5,000 to 9,999.....                                       |                              | 40.5           | 40.2  | 47.3  | 57.2  | 55.1  | 57.6  | 56.4  | 60.3  | 52.8  | 61.1     | 82.2      | 100.6     |  |
| 10,000 to 24,999.....                                     |                              | 92.0           | 94.5  | 87.0  | 73.9  | 90.3  | 99.9  | 102.6 | 90.6  | 91.8  | 97.0     | 104.9     | 116.5     |  |
| 25,000 or more.....                                       |                              | 363.3          | 363.7 | 388.7 | 404.2 | 408.4 | 339.2 | 335.2 | 332.1 | 321.2 | 348.6    | 351.9 (S) | 353.5 (S) |  |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

<sup>2</sup> Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

**KEY:** (S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available

**NOTE:** As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-53. Number of full-time equivalent (FTE) R&D scientists and engineers in R&D-performing companies,  
by industry, size of company, and source of R&D funds: January 1998**

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| Industry and size of company                                   | SIC code       | Total          | Federal   | Company  |
|--|----------------|----------------|-----------|----------|
|  |                | [In thousands] |           |          |
| All Industries.....  |                | 951.5          | 121.8 (S) | 829.7    |
| Distribution by industry:                                      |                |                |           |          |
| Manufacturing.....   |                | 682.1          | 101.6 (S) | 580.5    |
| Food, kindred, and tobacco products.....                       | 20,21          | 11.0           | 0.0       | 11.0     |
| Textiles and apparel.....                                      | 22,23          | 3.2            | (D)       | (D)      |
| Lumber, wood products, and furniture.....                      | 24,25          | 3.6            | 0.0       | 3.6      |
| Paper and allied products.....                                 | 26             | 10.4 (S)       | (D)       | (D)      |
| Chemicals and allied products.....                             | 28             | 89.5           | 3.0 (S)   | 86.5     |
| Industrial chemicals.....                                      | 281-82,286     | 26.7           | (D)       | (D)      |
| Drugs and medicines.....                                       | 283            | 45.3           | (D)       | (D)      |
| Other chemicals.....   | 284-85,287-89  | 17.5           | (D)       | (D)      |
| Petroleum refining and extraction.....                         | 13,29          | 7.9            | (D)       | (D)      |
| Rubber products.....   | 30             | 11.5           | (D)       | (D)      |
| Stone, clay, and glass products.....                           | 32             | 3.9 (S)        | 0.0 (S)   | 3.9      |
| Primary metals.....  | 33             | 6.4 (S)        | (D)       | (D)      |
| Ferrous metals and products.....                               | 331-32,3398-99 | 4.0 (S)        | (D)       | (D)      |
| Nonferrous metals and products.....                            | 333-36         | 2.5            | (D)       | (D)      |
| Fabricated metal products.....                                 | 34             | 12.8           | (D)       | (D)      |
| Machinery.....   | 35             | 112.1          | 0.8       | 111.3    |
| Office, computing, and accounting<br>machines... .....         | 357            | 66.1           | (D)       | (D)      |
| Other machinery, except electrical.....                        | 351-56,358-59  | 46.0           | (D)       | (D)      |
| Electrical equipment.....                                      | 36             | 171.6          | 17.2 (S)  | 154.4    |
| Radio and TV receiving equipment.....                          | 365            | 1.2            | (D)       | (D)      |
| Communication equipment.....                                   | 366            | 69.0           | (D)       | (D)      |
| Electronic components.....                                     | 367            | 66.8 (S)       | (D)       | (D)      |
| Other electrical equipment.....                                | 361-64,369     | 34.6           | (D)       | (D)      |
| Transportation equipment.....                                  | 37             | 144.1 (S)      | 58.1 (S)  | 86.0     |
| Motor vehicles and motor vehicles<br>equipment .....           | 371            | 64.1           | (D)       | (D)      |
| Other transportation equipment.....                            | 373-75,379     | 3.1            | (D)       | (D)      |
| Aircraft and missiles.....                                     | 372,376        | 77.0 (S)       | 51.5 (S)  | 25.5 (S) |
| Professional and scientific instruments.....                   | 38             | 66.3 (S)       | 20.2 (S)  | 46.1 (S) |
| Scientific and mechanical measuring<br>instruments .....       | 381-82         | 43.7 (S)       | 19.8 (S)  | 23.9 (S) |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87         | 22.6           | 0.4 (S)   | 22.2     |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39       | 27.8           | (D)       | (D)      |
| Nonmanufacturing.....  |                | 269.5          | 20.2      | 249.3    |
| Transportation and utilities.....                              | 40-42,44-49    | 15.2           | (D)       | (D)      |
| Communications.....  | 48             | 8.4 (S)        | (D)       | (D)      |
| Telephone communications.....                                  | 481            | 7.8 (S)        | (D)       | (D)      |
| Other communications.....                                      | 482-484,489    | 0.6            | 0.0       | 0.6      |

See explanatory information and SOURCE at end of table.

**Table A-53. Number of full-time equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry, size of company, and source of R&D funds: January 1998**

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| Industry and size of company   | SIC code                        | Total          | Federal   | Company   |
|--|---------------------------------|----------------|-----------|-----------|
|  |                                 | [In thousands] |           |           |
| <b>Distribution by industry:</b>   |                                 |                |           |           |
| Electric, gas, and sanitary services.....  | 49                              | 1.1            | (D)       | (D)       |
| Other transportation and utilities.....  | 40-42,44-47                     | 5.7            | (D)       | (D)       |
| Trade.....   | 50-59                           | 46.4           | 0.1 (S)   | 46.3 (S)  |
| Finance, insurance, and real estate.....   | 60-65,67                        | 18.3 (S)       | (D)       | (D)       |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 168.7          | 18.7      | 150.0     |
| Business services.....   | 73                              | 105.1          | 2.2       | 102.9     |
| Computer and data processing services.....   | 737                             | 102.6          | (D)       | (D)       |
| Other business services.....   | 731-736,738                     | 2.5            | (D)       | (D)       |
| Health services.....   | 80                              | 4.7            | (D)       | (D)       |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | 4.0            | (D)       | (D)       |
| Other health services.....   | 802-805,808-809                 | 0.7            | (D)       | (D)       |
| Engineering and management services.....   | 87                              | 54.5           | 16.4      | 38.1      |
| Engineering, architectural, and<br>surveying .....                                 | 871                             | 20.9           | 10.3      | 10.6 (S)  |
| Research, development, and testing.....  | 873                             | 28.3           | (D)       | (D)       |
| Other engineering and management<br>services .....                                 | 872,874                         | 5.3            | (D)       | (D)       |
| Other services.....  | 701,72,75-79,81,<br>83, 84, 89  | 4.4            | (D)       | (D)       |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | 20.8           | 0.0 (S)   | 20.8      |
| <b>Distribution by size of company:</b>  |                                 |                |           |           |
| [Number of employees]  |                                 |                |           |           |
| Total.....   |                                 | 951.5          | 121.8 (S) | 829.7     |
| Fewer than 500.....  |                                 | 201.8          | 6.5       | 195.3 (S) |
| 500 to 999.....  |                                 | 41.3           | 2.3       | 39.0 (S)  |
| 1,000 to 4,999.....  |                                 | 137.8          | 5.2 (S)   | 132.6     |
| 5,000 to 9,999.....  |                                 | 100.6          | 4.6       | 96.0      |
| 10,000 to 24,999.....  |                                 | 116.5          | 6.3       | 110.2     |
| 25,000 or more.....  |                                 | 353.5 (S)      | 96.9 (S)  | 256.6     |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.  
(S) = Indicates imputation of more than 50 percent.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-54. R&amp;D funds per R&amp;D scientist or engineer in R&amp;D-performing companies, by industry and size of company: 1987-97

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| Industry and size of company                    | SIC code           | 1987      | 1988    | 1989    | 1990    | 1991    | 1992        | 1993    | 1994    | 1995    | 1996    | 1997        |
|---|--------------------|-----------|---------|---------|---------|---------|-------------|---------|---------|---------|---------|-------------|
|   |                    | [Dollars] |         |         |         |         |             |         |         |         |         |             |
| All Industries.....                             |                    | 128,800   | 132,300 | 134,500 | 141,300 | 148,600 | 157,912     | 153,336 | 157,459 | 167,339 | 168,362 | 171,495     |
| Distribution by industry:                       |                    |           |         |         |         |         |             |         |         |         |         |             |
| Manufacturing.....                              |                    | NA        | NA      | NA      | NA      | NA      | NA          | NA      | 163,508 | 173,523 | 179,538 | 183,097     |
| Food, kindred, and tobacco products.....        | 20,21              | (S)       | (D)     | (D)     | (D)     | 130,000 | 144,215     | 135,261 | 152,494 | 167,017 | 154,853 | 166,821     |
| Textiles and apparel.....                       | 22,23              | (D)       | (D)     | (D)     | (D)     | (D)     | (D)         | (D)     | (D)     | (D)     | (D)     | (D)         |
| Lumber, wood products, and furniture.....       | 24,25              | (S)       | (D)     | (S)     | (S)     | (D)     | (D)         | (D)     | (D)     | (D)     | (D)     | 99,055      |
| Paper and allied products.....                  | 26                 | (D)       | (D)     | (S)     | (S)     | (D)     | (D)         | (D)     | (D)     | (D)     | (D)     | (D)         |
| Chemicals and allied products.....              | 28                 | 125,000   | 139,400 | 149,000 | 159,000 | 167,600 | 183,508     | (D)     | (D)     | 180,971 | (D)     | (D)         |
| Industrial chemicals.....                       | 281-82,286         | (S)       | (S)     | (S)     | (S)     | 181,000 | 193,871     | (D)     | (D)     | (D)     | (D)     | (D)         |
| Drugs and medicines.....                        | 283                | (D)       | 142,800 | (D)     | (D)     | (D)     | 196,631     | 202,607 | 190,662 | 205,637 | 212,185 | 262,201     |
| Other chemicals.....                            | 284-85,287-89      | (D)       | 105,600 | (D)     | (D)     | (D)     | 135,423     | (D)     | (D)     | (D)     | 158,355 | (D)         |
| Petroleum refining and extraction.....          | 13,29              | 187,400   | 182,700 | 194,000 | 201,800 | 217,000 | 205,318     | 208,360 | 202,587 | 209,495 | 189,981 | (D)         |
| Rubber products.....                            | 30                 | (D)       | (D)     | (D)     | (D)     | (D)     | (D)         | (D)     | (D)     | (D)     | (D)     | (D)         |
| Stone, clay, and glass products.....            | 32                 | 122,500   | (D)     | (D)     | (D)     | (D)     | (D)         | 137,990 | 141,251 | 110,172 | 124,685 | 160,632 (S) |
| Primary metals.....                             | 33                 | 131,500   | 118,600 | (S)     | (D)     | 142,200 | 114,057     | 138,552 | 115,371 | 111,743 | (D)     | 165,397 (S) |
| Ferrous metals and products.....                | 331-32,<br>3398-99 | (D)       | (S)     | (D)     | (D)     | (D)     | 138,851     | (D)     | (D)     | (D)     | (D)     | (D)         |
| Nonferrous metals and products.....             | 333-36             | (D)       | (S)     | (D)     | (D)     | (D)     | 138,326 (S) | (D)     | (D)     | (D)     | (D)     | (D)         |
| Fabricated metal products.....                  | 34                 | 76,600    | 88,100  | (S)     | (S)     | 115,500 | 123,828     | 129,131 | 111,431 | 112,010 | (D)     | 158,211     |
| Machinery.....                                  | 35                 | (D)       | (D)     | 130,000 | 138,500 | 147,800 | 152,797     | 100,631 | (D)     | (D)     | 152,894 | 184,263     |
| Office, computing, and accounting machines..... | 357                | (D)       | (D)     | (D)     | (D)     | (D)     | 99,564      | (D)     | (D)     | (D)     | (D)     | 230,471     |
| Other machinery, except electrical.....         | 351-56,358-59      | 98,300    | 99,400  | (D)     | (D)     | (D)     | 102,213     | 112,692 | 111,421 | (D)     | (D)     | 126,651     |
| Electrical equipment.....                       | 36                 | 124,300   | 124,100 | 132,400 | 142,800 | 147,100 | 150,118     | 144,725 | 152,615 | 163,626 | 171,907 | 159,879     |
| Radio and TV receiving equipment.....           | 365                | 97,900    | 124,200 | 103,400 | 113,200 | (D)     | (D)         | (D)     | (D)     | (D)     | (D)     | (D)         |
| Communication equipment.....                    | 366                | 155,300   | 160,300 | 170,600 | 177,100 | (S)     | (D)         | (D)     | (D)     | (D)     | (D)     | (D)         |
| Electronic components.....                      | 367                | 98,400    | (S)     | (S)     | 128,400 | (D)     | 127,801     | 154,366 | 148,071 | (D)     | (D)     | (D)         |
| Other electrical equipment.....                 | 361-64,369         | (S)       | 68,500  | (S)     | (S)     | (D)     | (D)         | (D)     | (D)     | (D)     | (D)     | 175,531     |

See explanatory information and SOURCE at end of table.

Table A-54. R&amp;D funds per R&amp;D scientist or engineer in R&amp;D-performing companies, by industry and size of company: 1987-97

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| Industry and size of company                                | SIC code                            | 1987      | 1988    | 1989    | 1990    | 1991    | 1992    | 1993        | 1994    | 1995        | 1996        | 1997        |  |
|---|-------------------------------------|-----------|---------|---------|---------|---------|---------|-------------|---------|-------------|-------------|-------------|--|
|   |                                     | [Dollars] |         |         |         |         |         |             |         |             |             |             |  |
| Distribution by industry:                                   |                                     |           |         |         |         |         |         |             |         |             |             |             |  |
| Transportation equipment.....                               | 37                                  | 183,400   | 195,600 | 211,700 | 215,700 | 189,400 | 191,274 | 196,777     | 216,686 | 233,968     | 205,665 (S) | 209,164 (S) |  |
| Motor vehicles and motor vehicles equipment.....            | 371                                 | (D)       | (D)     | (D)     | (D)     | (D)     | (D)     | (D)         | (D)     | (D)         | (D)         | (D)         |  |
| Other transportation equipment....                          | 373-75,379                          | (S)       | (D)     | (D)     | (D)     | (D)     | (D)     | (D)         | (D)     | (D)         | (D)         | (D)         |  |
| Aircraft and missiles.....                                  | 372,376                             | 180,400   | 193,300 | 207,300 | 213,700 | 177,000 | 180,552 | 176,450     | 186,898 | 213,328     | 170,733 (S) | 189,972 (S) |  |
| Professional and scientific instruments .....               | 38                                  | (S)       | (S)     | (S)     | (S)     | (S)     | (S)     | 115,180 (S) | 146,585 | 154,251     | 179,723 (S) | 206,112 (S) |  |
| Scientific and mechanical measuring instruments.....        | 381-82                              | (D)       | (S)     | (S)     | (S)     | (S)     | (S)     | 94,036 (S)  | 140,971 | 128,237     | (D)         | 188,560 (S) |  |
| Optical, surgical, photographic, and other instruments..... | 384-87                              | (D)       | 316,700 | (S)     | (S)     | (S)     | (S)     | 161,721     | 159,723 | 220,383     | (D)         | 240,293     |  |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39                            | (D)       | (D)     | (D)     | (D)     | (D)     | (D)     | (D)         | (D)     | (D)         | (D)         | 91,458      |  |
| Nonmanufacturing <sup>2</sup> .....                         |                                     | 69,100    | 74,900  | (S)     | (S)     | 137,400 | 152,411 | 159,188     | 140,374 | 150,578     | 138,882     | 141,730     |  |
| Transportation and utilities.....                           | 40-42,44-49                         | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | 370,933     | 159,442     | 135,133     |  |
| Communications.....   | 48                                  | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | (D)         | (D)         | (D)         |  |
| Telephone communications....                                | 481                                 | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | (D)         | (D)         | (D)         |  |
| Other communications.....                                   | 482-484,489                         | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | 157,435     | 94,495      | 84,028      |  |
| Electric, gas, and sanitary services.....                   | 49                                  | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | 274,704 (S) | 98,427 (S)  | (D)         |  |
| Other transportation and utilities..                        | 40-42,44-47                         | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | (D)         | (D)         | (D)         |  |
| Trade.....  | 50-59                               | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | (D)         | 146,774     | (D)         |  |
| Finance, insurance, and real estate .....                   | 60-65,67                            | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | (D)         | (D)         | (D)         |  |
| Services.....   | 701,72,73,<br>75-81,83,84,<br>87,89 | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | 256,085     | 134,175     | 143,277     |  |
| Business services.....                                      | 73                                  | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | 231,680     | 126,625     | 123,974     |  |
| Computer and data processing services.....                  | 737                                 | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | 234,483     | (D)         | 124,766     |  |
| Other business services.....                                | 731-736,738                         | NA        | NA      | NA      | NA      | NA      | NA      | NA          | NA      | 158,453     | (D)         | 95,896      |  |

See explanatory information and SOURCE at end of table.

Table A-54. R&amp;D funds per R&amp;D scientist or engineer in R&amp;D-performing companies, by industry and size of company: 1987-97

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| Industry and size of company  | SIC code                     | 1987      | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995        | 1996        | 1997        |  |
|---|------------------------------|-----------|------|------|------|------|------|------|------|-------------|-------------|-------------|--|
|   |                              | [Dollars] |      |      |      |      |      |      |      |             |             |             |  |
| Distribution by industry:   |                              |           |      |      |      |      |      |      |      |             |             |             |  |
| Health services.....  | 80                           | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 305,132     | (D)         | (D)         |  |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                  | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)         | 133,871 (S) | (D)         |  |
| Other health services.....  | 802-805,<br>808-809          | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)         | (D)         | 100,372 (S) |  |
| Engineering and management services.....  | 87                           | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 289,459     | 149,040     | 186,234     |  |
| Engineering, architectural, and surveying.....                                  | 871                          | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 257,067 (S) | 81,271 (S)  | 104,608     |  |
| Research, development, and testing.....   | 873                          | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)         | 204,445     | (D)         |  |
| Other engineering and management services.....                                  | 872,874                      | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | (D)         | 93,929 (S)  | (D)         |  |
| Other services.....   | 701,72,75-79,<br>81,83,84,89 | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 221,147     | (D)         | (D)         |  |
| Other nonmanufacturing industries <sup>1</sup> .....                            | 07-12,14,15,<br>161-162,17   | NA        | NA   | NA   | NA   | NA   | NA   | NA   | NA   | 179,020     | (D)         | 85,625      |  |

See explanatory information and SOURCE at end of table.

Table A-54. R&amp;D funds per R&amp;D scientist or engineer in R&amp;D-performing companies, by industry and size of company: 1987-97

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| Industry and size of company                              | SIC code | 1987      | 1988    | 1989    | 1990    | 1991    | 1992    | 1993    | 1994    | 1995    | 1996        | 1997        |  |
|---|----------|-----------|---------|---------|---------|---------|---------|---------|---------|---------|-------------|-------------|--|
|   |          | [Dollars] |         |         |         |         |         |         |         |         |             |             |  |
| Distribution by size of company:<br>[Number of employees] |          |           |         |         |         |         |         |         |         |         |             |             |  |
| Total.....  |          | 128,800   | 132,300 | 134,500 | 141,300 | 148,600 | 157,912 | 153,336 | 157,459 | 167,339 | 168,362     | 171,495     |  |
| Fewer than 500.....                                       |          | 66,800    | 67,100  | 66,200  | (S)     | 103,400 | 111,358 | 106,888 | 97,012  | 109,319 | 118,280     | 126,925     |  |
| 500 to 999.....   |          | 92,600    | (S)     | 98,200  | (S)     | 178,700 | 176,585 | 87,233  | 123,239 | 141,660 | 124,765     | 125,611     |  |
| 1,000 to 4,999.....                                       |          | 91,900    | 100,600 | 101,900 | 91,400  | 119,400 | 127,135 | 128,565 | 134,558 | 144,213 | 142,747     | 145,436     |  |
| 5,000 to 9,999.....                                       |          | 102,900   | 100,400 | 102,500 | 110,800 | 150,800 | 148,285 | 156,899 | 144,327 | 167,284 | 161,035     | 156,090     |  |
| 10,000 to 24,999.....                                     |          | 132,700   | 143,000 | 127,300 | 135,300 | 167,300 | 156,190 | 160,229 | 172,678 | 180,849 | 199,722     | 194,323     |  |
| 25,000 or more.....                                       |          | 157,700   | 160,700 | 168,200 | 193,700 | 180,100 | 182,839 | 184,804 | 193,002 | 200,606 | 199,286 (S) | 207,375 (S) |  |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

<sup>2</sup> Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

[9]

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NA = Not available.

**NOTES:** The number of full-time-equivalent R&D scientists and engineers used to estimate the R&D funds per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier year, and the ratio is attributed to the earlier year.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-55. R&amp;D funds per R&amp;D scientist or engineer in R&amp;D-performing companies, by industry and size of company: 1997

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| Industry   | SIC code       | Total       | Size of company                |                            |                                |                                |                                  |                                |
|--|----------------|-------------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                |             | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                |             | [Dollars]                      |                            |                                |                                |                                  |                                |
| All Industries.....                                |                | 171,495     | 126,925                        | 125,611                    | 145,436                        | 156,090                        | 194,323                          | 207,375 (S)                    |
| Manufacturing.....                                 |                | 183,097     | 107,371                        | 119,645                    | 155,418                        | 179,821                        | 196,310                          | 211,428 (S)                    |
| Food, kindred, and tobacco products.....           | 20,21          | 166,821     | 140,858                        | 85,143                     | 122,705                        | 135,993 (S)                    | 206,231                          | 240,244                        |
| Textiles and apparel.....                          | 22,23          | (D)         | 86,033                         | 114,598                    | 92,759                         | (D)                            | 79,036 (S)                       | (D)                            |
| Lumber, wood products, and furniture.....          | 24,25          | 99,055      | 90,647                         | 72,975                     | 104,396                        | 114,573 (S)                    | (D)                              | (D)                            |
| Paper and allied products.....                     | 26             | (D)         | 112,049                        | (D)                        | 121,934                        | 238,603 (S)                    | 133,381 (S)                      | 139,062 (S)                    |
| Chemicals and allied products.....                 | 28             | (D)         | 122,262                        | 113,986                    | 190,116                        | 286,819                        | 214,199                          | 226,137                        |
| Industrial chemicals.....                          | 281-82,286     | (D)         | 67,060                         | 112,931                    | 203,794                        | 251,014                        | 210,418                          | (D)                            |
| Drugs and medicines.....                           | 283            | 262,201     | 233,546                        | 117,987                    | 236,287                        | 364,004                        | 235,345                          | 272,772                        |
| Other chemicals.....                               | 284-85,287-89  | (D)         | 101,561                        | 111,875                    | 99,621 (S)                     | 137,690                        | (D)                              | (D)                            |
| Petroleum refining and extraction.....             | 13,29          | (D)         | 32,757                         | (D)                        | 222,952                        | (D)                            | 181,123                          | 211,995 (S)                    |
| Rubber products.....                               | 30             | (D)         | 71,782                         | 116,322                    | 156,676                        | 90,391 (S)                     | 191,615 (S)                      | (D)                            |
| Stone, clay, and glass products.....               | 32             | 160,632 (S) | 50,354                         | 127,983 (S)                | 89,078                         | 180,095 (S)                    | 209,185 (S)                      | 0                              |
| Primary metals.....                                | 33             | 165,397 (S) | 95,717                         | 63,257                     | 155,831 (S)                    | 270,034 (S)                    | 164,806 (S)                      | (D)                            |
| Ferrous metals and products.....                   | 331-32,3398-99 | (D)         | 54,013                         | (D)                        | 103,952 (S)                    | 261,671 (S)                    | (D)                              | (D)                            |
| Nonferrous metals and products.....                | 333-36         | (D)         | 115,109                        | 61,819                     | 221,876 (S)                    | (D)                            | (D)                              | (D)                            |
| Fabricated metal products.....                     | 34             | 158,211     | 130,048                        | 85,415                     | 100,954                        | 156,968                        | 168,450                          | (D)                            |
| Machinery.....                                     | 35             | 184,263     | 152,341                        | 114,764                    | 148,858                        | 104,896                        | 207,846                          | (D)                            |
| Office, computing, and accounting<br>machines..... | 357            | 230,471     | 189,226                        | 96,337                     | 230,021                        | 133,803                        | 208,106                          | (D)                            |
| Other machinery, except electrical.....            | 351-56,358-59  | 126,651     | 130,061                        | 121,857                    | 106,835                        | 88,458 (S)                     | 207,212                          | (D)                            |
| Electrical equipment.....                          | 36             | 159,879     | 109,740                        | 125,463                    | 141,748                        | 213,514                        | 160,180 (S)                      | 169,198 (S)                    |
| Radio and TV receiving equipment.....              | 365            | (D)         | 126,786                        | (D)                        | (D)                            | (D)                            | 0                                | 0                              |
| Communication equipment.....                       | 366            | (D)         | 98,491                         | 134,441                    | 100,257                        | 178,108 (S)                    | (D)                              | (D)                            |
| Electronic components.....                         | 367            | (D)         | 144,173                        | 130,813                    | 175,045                        | 280,349                        | 208,593 (S)                      | (D)                            |
| Other electrical equipment.....                    | 361-64,369     | 175,531     | 66,752                         | 107,393                    | 144,222                        | 225,424                        | 129,823                          | (D)                            |

See explanatory information and SOURCE at end of table.

Table A-55. R&amp;D funds per R&amp;D scientist or engineer in R&amp;D-performing companies, by industry and size of company: 1997

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| Industry   | SIC code                        | Total       | Size of company                |                            |                                |                                |                                  |                                |
|--|---------------------------------|-------------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                                 |             | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                                 |             | [Dollars]                      |                            |                                |                                |                                  |                                |
| Transportation equipment.....                                  | 37                              | 209,164 (S) | 108,879                        | 175,356 (S)                | 125,420                        | 134,551                        | 209,273                          | 214,566 (S)                    |
| Motor vehicles and motor vehicles<br>equipment.....            | 371                             | (D)         | (D)                            | (D)                        | 114,479                        | 66,050 (S)                     | 193,232                          | (D)                            |
| Other transportation equipment.....                            | 373-75,379                      | (D)         | (D)                            | (D)                        | (D)                            | (D)                            | (D)                              | (D)                            |
| Aircraft and missiles.....                                     | 372,376                         | 189,972 (S) | (D)                            | (D)                        | 172,351                        | 194,519 (S)                    | (D)                              | 189,829 (S)                    |
| Professional and scientific instruments.....                   | 38                              | 206,112 (S) | 114,124                        | 128,332                    | 172,835                        | 264,544                        | (D)                              | 253,713 (S)                    |
| Scientific and mechanical measuring<br>instruments.....        | 381-82                          | 188,560 (S) | 123,256                        | 129,716                    | 139,368                        | (D)                            | (D)                              | 213,298 (S)                    |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87                          | 240,293     | 96,773                         | 125,111                    | 208,366                        | 210,159                        | (D)                              | (D)                            |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39                        | 91,458      | 81,690                         | 80,714                     | 135,255                        | 145,926 (S)                    | (D)                              | 54,963 (S)                     |
| Nonmanufacturing.....  |                                 | 141,730     | 140,246                        | 135,111                    | 123,918                        | 97,973                         | 187,421                          | 171,370                        |
| Transportation and utilities.....                              | 40-42,44-49                     | 135,133     | 68,134                         | 153,224                    | 109,494                        | (D)                            | 417,472                          | 140,208                        |
| Communications.....  | 48                              | (D)         | 40,955                         | (D)                        | (D)                            | (D)                            | 0                                | 124,749 (S)                    |
| Telephone communications.....                                  | 481                             | (D)         | 0                              | (D)                        | 0                              | (D)                            | 0                                | 124,604 (S)                    |
| Other communications.....                                      | 482-484,489                     | 84,028      | 40,955                         | (D)                        | (D)                            | 0                              | 0                                | (D)                            |
| Electric, gas, and sanitary services.....                      | 49                              | (D)         | 102,330                        | (D)                        | 108,379                        | (D)                            | 422,472                          | (D)                            |
| Other transportation and utilities.....                        | 40-42,44-47                     | (D)         | 91,155                         | (D)                        | (D)                            | (D)                            | (D)                              | 234,592                        |
| Trade.....   | 50-59                           | (D)         | 166,281                        | 132,561                    | 181,430                        | 150,479                        | (D)                              | 238,956                        |
| Finance, insurance, and real estate.....                       | 60-65,67                        | (D)         | 102,163 (S)                    | (D)                        | 100,060 (S)                    | 122,163 (S)                    | (D)                              | 42,829                         |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 143,277     | 149,105                        | 137,212                    | 110,725                        | 79,154                         | 169,814                          | (D)                            |
| Business services.....   | 73                              | 123,974     | 114,446                        | 101,790                    | 126,360                        | 82,666                         | (D)                              | 292,608 (S)                    |
| Computer and data processing<br>services.....                  | 737                             | 124,766     | 117,139                        | 101,080                    | 126,285                        | 83,404                         | (D)                              | (D)                            |
| Other business services.....                                   | 731-736,738                     | 95,896      | 26,375                         | 121,607                    | 129,573                        | 38,466                         | (D)                              | 230,542                        |

See explanatory information and SOURCE at end of table.

Table A-55. R&amp;D funds per R&amp;D scientist or engineer in R&amp;D-performing companies, by industry and size of company: 1997

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| Industry  | SIC code                     | Total       | Size of company                |                            |                                |                                |                                  |                                |
|---|------------------------------|-------------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                              |             | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                              |             | [Dollars]                      |                            |                                |                                |                                  |                                |
| Health services.....  | 80                           | (D)         | 36,927                         | 6,394 (S)                  | 107,065 (S)                    | (D)                            | (D)                              | 0                              |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs.... | 801,806,807                  | (D)         | 32,932                         | (D)                        | (D)                            | 0                              | (D)                              | 0                              |
| Other health services.....  | 802-805,808-809              | 100,372 (S) | 88,133                         | (D)                        | (D)                            | (D)                            | 0                                | 0                              |
| Engineering and management services.....  | 87                           | 186,234     | 199,799                        | 223,701                    | 47,536 (S)                     | (D)                            | (D)                              | (D)                            |
| Engineering, architectural, and<br>surveying.....                                 | 871                          | 104,608     | 136,571                        | 153,737                    | 59,978 (S)                     | (D)                            | (D)                              | 0                              |
| Research, development, and testing.....   | 873                          | (D)         | 229,443                        | 280,532                    | (D)                            | 0                              | (D)                              | (D)                            |
| Other engineering and management<br>services.....                                 | 872,874                      | (D)         | 217,670                        | 115,581 (S)                | (D)                            | (D)                            | (D)                              | 0                              |
| Other services.....   | 701,72,75-79,81,<br>83,84,89 | (D)         | 105,126                        | 147,365                    | 98,482                         | (D)                            | (D)                              | (D)                            |
| Other nonmanufacturing industries <sup>1</sup> .....                              | 07-12,14,15,<br>161-162,17   | 85,625      | 81,545                         | 38,803                     | 84,087 (S)                     | 184,313                        | (D)                              | (D)                            |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

**NOTES:** The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier year, and the ratio is attributed to the earlier year.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-56. R&D funds per R&D scientist or engineer in R&D-performing companies ranked by size of R&D program: 1987-97**

| Companies ranked by size of R&D program            | 1987    | 1988    | 1989    | 1990    | 1991    | 1992    | 1993    | 1994        | 1995        | 1996        | 1997        |
|--|---------|---------|---------|---------|---------|---------|---------|-------------|-------------|-------------|-------------|
| [Dollars]  |         |         |         |         |         |         |         |             |             |             |             |
| First 4.....                                       | 222,600 | 226,200 | 218,100 | 219,600 | 213,200 | 202,492 | 252,629 | 218,906     | 234,791     | 231,784     | 229,602 (S) |
| Next 4.....  | 196,900 | 210,700 | 225,800 | 249,000 | 223,700 | 238,950 | 199,559 | 245,626 (S) | 188,928 (S) | 185,032 (S) | 180,389     |
| Next 12.....                                       | 141,600 | 153,000 | 148,700 | 129,100 | 159,900 | 170,276 | 199,118 | 188,437     | 190,548     | 202,670     | 238,022 (S) |
| Next 20.....                                       | 146,300 | 154,500 | 132,500 | 145,800 | (S)     | (S)     | (S)     | 182,699     | 204,159     | 210,552     | 213,496     |
| Next 60.....                                       | 128,700 | 141,300 | 145,400 | 164,200 | 170,500 | 181,760 | 193,925 | 181,163     | 196,023     | 202,405     | 206,350     |
| Next 100.....                                      | 128,600 | 137,300 | 141,900 | 137,000 | 169,000 | 173,101 | 138,227 | 174,524     | 162,707     | 160,560     | 155,255     |
| Next 200.....                                      | 110,800 | 124,500 | 106,100 | 120,200 | 121,000 | 126,545 | 140,292 | 156,025     | 152,977     | 151,812     | 157,347     |
| Average of above 400 R&D performing companies..... | 153,100 | 160,600 | 161,500 | 161,200 | 169,000 | 158,098 | 154,814 | 174,536     | 167,339     | 168,362     | 171,495     |

**KEY:** (S) = Indicates imputation of more than 50 percent. Prior to 1993, data have been withheld.

**NOTES:** The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier year, and the ratio is attributed to the earlier year.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-57. Domestic employment of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry  | SIC code       | Total  | Size of company                |                            |                                |                                |                                  |                                |
|---|----------------|--------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|   |                |        | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|   |                |        | [In thousands]                 |                            |                                |                                |                                  |                                |
| 1996  |                |        |                                |                            |                                |                                |                                  |                                |
| All Industries.....                             |                | 18,102 | 1,831                          | 806                        | 2,838                          | 2,041                          | 2,734                            | 7,852                          |
| Manufacturing.....                              |                | 11,347 | 1,251                          | 618                        | 2,095                          | 1,377                          | 2,021                            | 3,984                          |
| Food, kindred, and tobacco products.....        | 20,21          | 1,085  | 51                             | 40                         | 217                            | 114                            | 161                              | 500                            |
| Textiles and apparel.....                       | 22,23          | 430    | 53                             | (D)                        | 105                            | 59                             | 141                              | (D)                            |
| Lumber, wood products, and furniture.....       | 24,25          | 331    | 45                             | (D)                        | 74                             | 67                             | (D)                              | (D)                            |
| Paper and allied products.....                  | 26             | 560    | 18                             | 7                          | 100                            | 41                             | 155                              | 239                            |
| Chemicals and allied products.....              | 28             | 1,049  | 64                             | 38                         | 198                            | 168                            | 281                              | 301                            |
| Industrial chemicals.....                       | 281-82,286     | 444    | 19                             | 20                         | 75                             | 61                             | 129                              | 140                            |
| Drugs and medicines.....                        | 283            | 304    | 6                              | (D)                        | 53                             | 40                             | 105                              | (D)                            |
| Other chemicals.....                            | 284-85,287-89  | 301    | 38                             | (D)                        | 70                             | 67                             | 47                               | (D)                            |
| Petroleum refining and extraction.....          | 13,29          | 286    | 10                             | (D)                        | 17                             | (D)                            | 133                              | 121                            |
| Rubber products.....                            | 30             | 453    | 67                             | 57                         | 145                            | (D)                            | 58                               | (D)                            |
| Stone, clay, and glass products.....            | 32             | 190    | 21                             | 10                         | 67                             | 33                             | 60                               | 0                              |
| Primary metals.....                             | 33             | 406    | 42                             | 10                         | 68                             | 96                             | 88                               | 102                            |
| Ferrous metals and products.....                | 331-32,3398-99 | 208    | 26                             | (D)                        | 42                             | 63                             | (D)                              | (D)                            |
| Nonferrous metals and products.....             | 333-36         | 198    | 16                             | (D)                        | 26                             | 33                             | (D)                              | (D)                            |
| Fabricated metal products.....                  | 34             | 604    | 121                            | (D)                        | 139                            | 65                             | 157                              | (D)                            |
| Machinery.....                                  | 35             | 1,322  | 197                            | 77                         | 399                            | 183                            | 279                              | 186                            |
| Office, computing, and accounting machines..... | 357            | 278    | 15                             | (D)                        | 26                             | 44                             | 65                               | (D)                            |
| Other machinery, except electrical.....         | 351-56,358-59  | 1,044  | 182                            | (D)                        | 373                            | 140                            | 214                              | (D)                            |
| Electrical equipment.....                       | 36             | 1,388  | 170                            | 115                        | 269                            | 133                            | 210                              | 491                            |
| Radio and TV receiving equipment.....           | 365            | 29     | 8                              | 4                          | 10                             | (D)                            | 0                                | 0                              |
| Communication equipment.....                    | 366            | 231    | 33                             | 20                         | 54                             | (D)                            | (D)                              | (D)                            |
| Electronic components.....                      | 367            | 551    | 69                             | 49                         | 108                            | 48                             | (D)                              | (D)                            |
| Other electrical equipment.....                 | 361-64,369     | 576    | 60                             | 42                         | 97                             | 45                             | 116                              | 217                            |

See explanatory information and SOURCE at end of table.

Table A-57. Domestic employment of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry   | SIC code                        | Total  | Size of company                |                            |                                |                                |                                  |                                |
|--|---------------------------------|--------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                                 |        | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                                 |        | [In thousands]                 |                            |                                |                                |                                  |                                |
| 1996   |                                 |        |                                |                            |                                |                                |                                  |                                |
| Transportation equipment.....  | 37                              | 1,948  | 22                             | 39                         | 58                             | 231                            | 131                              | 1,468                          |
| Motor vehicles and motor vehicles equipment.....                                   | 371                             | 959    | (D)                            | (D)                        | 23                             | 55                             | 87                               | 744                            |
| Other transportation equipment.....  | 373-75,379                      | 284    | (D)                            | 0                          | 19                             | (D)                            | (D)                              | 85                             |
| Aircraft and missiles.....   | 372,376                         | 705    | 6                              | (D)                        | 17                             | (D)                            | (D)                              | 639                            |
| Professional and scientific instruments.....                                       | 38                              | 608    | 98                             | (D)                        | 152                            | 71                             | (D)                              | 219                            |
| Scientific and mechanical measuring instruments.....                               | 381-82                          | 294    | 50                             | 28                         | 57                             | 20                             | (D)                              | (D)                            |
| Optical, surgical, photographic, and<br>other instruments.....                     | 384-87                          | 314    | 48                             | (D)                        | 95                             | 51                             | (D)                              | (D)                            |
| Other manufacturing industries.....  | 27,31,39                        | 686    | 273                            | 48                         | 85                             | 62                             | 91                               | 128                            |
| Nonmanufacturing .....   |                                 | 6,755  | 580                            | 188                        | 743                            | 664                            | 713                              | 3,868                          |
| Transportation and utilities.....  | 40-42,44-49                     | 2,017  | 17                             | 3                          | 140                            | 147                            | 191                              | 1,518                          |
| Communications.....  | 48                              | 826    | 5                              | (D)                        | (D)                            | (D)                            | 0                                | (D)                            |
| Telephone communications.....  | 481                             | 815    | 0                              | 0                          | 0                              | (D)                            | 0                                | (D)                            |
| Other communications.....  | 482-484,489                     | 11     | 5                              | (D)                        | (D)                            | 0                              | 0                                | 0                              |
| Electric, gas, and sanitary services.....  | 49                              | 593    | 5                              | (D)                        | 127                            | 132                            | (D)                              | 167                            |
| Other transportation and utilities.....  | 40-42,44-47                     | 599    | 8                              | 0                          | 9 (S)                          | (D)                            | (D)                              | 542                            |
| Trade.....   | 50-59                           | 1,577  | 166                            | 75                         | 163                            | 238                            | 87                               | 849                            |
| Finance, insurance, and real estate.....   | 60-65,67                        | 724    | 12                             | 2                          | 163                            | 81                             | (D)                              | (D)                            |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 2,219  | 312                            | 92                         | 239                            | 151                            | 393                              | 1,033                          |
| Business services.....   | 73                              | 1,422  | 161                            | 70                         | 139                            | 119                            | 143                              | 790                            |
| Computer and data processing services.....   | 737                             | 540    | 143                            | 65                         | 113                            | 50                             | (D)                              | (D)                            |
| Other business services.....   | 731-736,738                     | 882    | 17                             | 5                          | 26                             | 69                             | (D)                              | (D)                            |
| Health services.....   | 80                              | 91     | 15                             | (D)                        | 13                             | (D)                            | 50                               | 0                              |
| Offices and clinics of medical doctors, hospitals,<br>medical and dental labs..... | 801,806,807                     | 74     | 14                             | (D)                        | (D)                            | 0                              | 50                               | 0                              |
| Other health services.....   | 802-805,808-809                 | 17 (S) | 2                              | (D)                        | (D)                            | (D)                            | 0                                | 0                              |

See explanatory information and SOURCE at end of table.

Table A-57. Domestic employment of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry                                       | SIC code                     | Total  | Size of company                |                            |                                |                                |                                  |                                |
|--|------------------------------|--------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                              |        | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                              |        | [In thousands]                 |                            |                                |                                |                                  |                                |
| 1996   |                              |        |                                |                            |                                |                                |                                  |                                |
| Engineering and management services.....       | 87                           | 507    | 123                            | (D)                        | 67                             | (D)                            | 76                               | (D)                            |
| Engineering, architectural, and surveying..... | 871                          | 140    | 41                             | (D)                        | 43                             | (D)                            | 44                               | 0                              |
| Research, development, and testing.....        | 873                          | 302    | 53                             | (D)                        | 5                              | 0                              | (D)                              | (D)                            |
| Other engineering and management services..... | 872,874                      | 65     | 29                             | (D)                        | 19                             | 0                              | (D)                              | 0                              |
| Other services.....                            | 701,72,75-79,81,<br>83,84,89 | 199    | 13                             | 2                          | 20                             | (D)                            | 123                              | (D)                            |
| Other nonmanufacturing industries .....        | 07-12,14,15,<br>161-162,17   | 218    | 73                             | 15                         | 38                             | 46                             | (D)                              | (D)                            |
| 1997   |                              |        |                                |                            |                                |                                |                                  |                                |
| All Industries.....                            |                              | 20,221 | 1,975                          | 790                        | 2,860                          | 2,254                          | 3,188                            | 9,154                          |
| Manufacturing.....                             |                              | 11,700 | 1,235                          | 626                        | 2,090                          | 1,403                          | 2,170                            | 4,176                          |
| Food, kindred, and tobacco products.....       | 20,21                        | 1,217  | 67                             | 91                         | 245                            | 120                            | 229                              | 465                            |
| Textiles and apparel.....                      | 22,23                        | 384    | 40                             | (D)                        | 112                            | 21                             | 112                              | (D)                            |
| Lumber, wood products, and furniture.....      | 24,25                        | 252    | 20                             | 41                         | 68                             | 65                             | 59                               | 0                              |
| Paper and allied products.....                 | 26                           | 547    | 16                             | 2 (S)                      | 84                             | 48                             | 162                              | 235                            |
| Chemicals and allied products.....             | 28                           | 1,019  | 72                             | 23                         | 205                            | 195                            | 276                              | 248                            |
| Industrial chemicals.....                      | 281-82,286                   | 411    | 16                             | (D)                        | 86                             | 83                             | 109                              | (D)                            |
| Drugs and medicines.....                       | 283                          | 316    | 23                             | 2                          | 54                             | 49                             | 89                               | 99                             |
| Other chemicals.....                           | 284-85,287-89                | 292    | 33                             | (D)                        | 64                             | 63                             | 78                               | (D)                            |
| Petroleum refining and extraction.....         | 13,29                        | 241    | 1                              | 2                          | 33                             | 0                              | 114                              | 90                             |
| Rubber products.....                           | 30                           | 475    | 73                             | 62                         | 149                            | (D)                            | 67                               | (D)                            |
| Stone, clay, and glass products.....           | 32                           | 163    | 10                             | 8                          | 31                             | 33                             | 81                               | 0                              |
| Primary metals.....                            | 33                           | 494    | 12                             | 34                         | 82                             | 122                            | 143                              | 102                            |
| Ferrous metals and products.....               | 331-32,3398-99               | 301    | 2                              | 2                          | 41                             | 101                            | (D)                              | (D)                            |
| Nonferrous metals and products.....            | 333-36                       | 193    | 10                             | 32                         | 41                             | 21 (S)                         | (D)                              | (D)                            |

See explanatory information and SOURCE at end of table.

Table A-57. Domestic employment of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry   | SIC code      | Total | Size of company                |                            |                                |                                |                                  |                                |
|--|---------------|-------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |               |       | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |               |       | [In thousands]                 |                            |                                |                                |                                  |                                |
| 1997   |               |       |                                |                            |                                |                                |                                  |                                |
| Fabricated metal products.....                                 | 34            | 681   | 127                            | (D)                        | 160                            | 64                             | 171                              | (D)                            |
| Machinery.....   | 35            | 1,387 | 204                            | 74                         | 324                            | 204                            | 275                              | 305                            |
| Office, computing, and accounting machines.....                | 357           | 419   | 20                             | (D)                        | 44                             | 61                             | 83                               | (D)                            |
| Other machinery, except electrical.....                        | 351-56,358-59 | 968   | 184                            | (D)                        | 281                            | 144                            | 193                              | (D)                            |
| Electrical equipment.....                                      | 36            | 1,586 | 167                            | 99                         | 287                            | 235                            | 195                              | 604                            |
| Radio and TV receiving equipment.....                          | 365           | 14    | 3                              | (D)                        | 10                             | 0                              | 0                                | (D)                            |
| Communication equipment.....                                   | 366           | 378   | 37                             | (D)                        | 49                             | 116                            | 0                                | (D)                            |
| Electronic components.....                                     | 367           | 491   | 83                             | 42                         | 96                             | 69                             | 86                               | (D)                            |
| Other electrical equipment.....                                | 361-64,369    | 703   | 44                             | 37                         | 132                            | 50                             | 109                              | 331                            |
| Transportation equipment.....                                  | 37            | 1,834 | 40                             | 42                         | 54                             | 101                            | 134                              | 1,463                          |
| Motor vehicles and motor vehicles equipment.....               | 371           | 1,023 | (D)                            | 39                         | 18                             | (D)                            | 102                              | 766                            |
| Other transportation equipment.....                            | 373-75,379    | 87    | 0                              | (D)                        | 13                             | (D)                            | (D)                              | (D)                            |
| Aircraft and missiles.....                                     | 372,376       | 725   | (D)                            | (D)                        | 23                             | 38                             | (D)                              | (D)                            |
| Professional and scientific instruments.....                   | 38            | 676   | 90                             | 40                         | 158                            | 72                             | 43                               | 272                            |
| Scientific and mechanical measuring instruments.....           | 381-82        | 381   | 64                             | 26                         | 57                             | 26                             | (D)                              | (D)                            |
| Optical, surgical, photographic, and<br>other instruments..... | 384-87        | 295   | 26                             | 15                         | 101                            | 46                             | (D)                              | (D)                            |
| Other manufacturing industries <sup>1</sup> .....              | 27,31,39      | 743   | 296                            | 32                         | 97                             | 77                             | 109                              | 132                            |
| Nonmanufacturing.....  |               | 8,521 | 740                            | 164                        | 770                            | 851                            | 1,018                            | 4,978                          |
| Transportation and utilities.....                              | 40-42,44-49   | 3,980 | 15                             | 4                          | 142                            | 438                            | 166                              | 3,215                          |
| Communications.....  | 48            | 1,109 | 2                              | (D)                        | 5                              | 314                            | 0                                | (D)                            |
| Telephone communications.....                                  | 481           | 1,050 | 0                              | 0                          | 0                              | 314                            | 0                                | 736                            |
| Other communications.....                                      | 482-484,489   | 59    | 2                              | (D)                        | 5                              | 0                              | 0                                | (D)                            |
| Electric, gas, and sanitary services.....                      | 49            | 525   | 3                              | (D)                        | 128                            | (D)                            | (D)                              | (D)                            |
| Other transportation and utilities.....                        | 40-42,44-47   | 2,346 | 11                             | (D)                        | 8 (S)                          | (D)                            | (D)                              | 2,290                          |
| Trade.....   | 50-59         | 1,655 | 272                            | 10                         | 162                            | 137                            | 508                              | 567                            |
| Finance, insurance, and real estate.....                       | 60-65,67      | 584   | 33                             | (D)                        | 62                             | 68                             | (D)                              | (D)                            |

See explanatory information and SOURCE at end of table.

Table A-57. Domestic employment of R&amp;D-performing companies, by industry and size of company: 1996-97

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| Industry   | SIC code                        | Total | Size of company                |                            |                                |                                |                                  |                                |
|--|---------------------------------|-------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
|  |                                 |       | Fewer than<br>500<br>employees | 500 to<br>999<br>employees | 1,000 to<br>4,999<br>employees | 5,000 to<br>9,999<br>employees | 10,000 to<br>24,999<br>employees | 25,000<br>or more<br>employees |
|  |                                 |       | [In thousands]                 |                            |                                |                                |                                  |                                |
| 1997   |                                 |       |                                |                            |                                |                                |                                  |                                |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 2,036 | 319                            | 118                        | 358                            | 141                            | 288                              | 812                            |
| Business services.....   | 73                              | 1,318 | 172                            | 56                         | 139                            | 97                             | 76                               | 777                            |
| Computer and data processing services.....   | 737                             | 510   | 163                            | (D)                        | 108                            | 65                             | (D)                              | 90 (S)                         |
| Other business services.....   | 731-736,738                     | 807   | 9                              | (D)                        | 32                             | 32                             | (D)                              | 687                            |
| Health services.....   | 80                              | 109   | 16                             | 2                          | 36                             | 0                              | 55                               | 0                              |
| Offices and clinics of medical doctors, hospitals,<br>medical and dental labs..... | 801,806,807                     | 97    | 14                             | 2                          | 27                             | 0                              | 55                               | 0                              |
| Other health services.....   | 802-805,808-809                 | 12    | 3                              | 0                          | 9                              | 0                              | 0                                | 0                              |
| Engineering and management services.....   | 87                              | 325   | 108                            | 29                         | 50                             | (D)                            | 83                               | (D)                            |
| Engineering, architectural, and surveying.....                                     | 871                             | 148   | 47                             | (D)                        | 39                             | (D)                            | 47                               | 0                              |
| Research, development, and testing.....  | 873                             | 98    | 51                             | 9                          | 3                              | 0                              | (D)                              | (D)                            |
| Other engineering and management services.....                                     | 872,874                         | 79    | 10                             | 11                         | 8                              | (D)                            | (D)                              | 0                              |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | 284   | 23                             | 31                         | 133                            | (D)                            | 74                               | (D)                            |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | 266   | 101                            | (D)                        | 46                             | 67                             | (D)                              | (D)                            |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table A-58. R&amp;D scientists and engineers per 1,000 employees in R&amp;D-performing companies, by industry and size of company: 1987-97

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| Industry and size of company                     | SIC code       | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994    | 1995    | 1996    | 1997    |
|--|----------------|------|------|------|------|------|------|------|---------|---------|---------|---------|
| All Industries <sup>1</sup> .....                |                | NA   | 44      | 47      | 49      | 47      |
| Distribution by industry:                        |                |      |      |      |      |      |      |      |         |         |         |         |
| Manufacturing.....                               |                | 45   | 46   | 46   | 47   | 50   | 51   | 52   | 47      | 54      | 56      | 58      |
| Food, kindred, and tobacco products.....         | 20,21          | 7    | 8    | 8    | 8    | 9    | 9    | 9    | 8       | 10      | 10      | 9       |
| Textiles and apparel.....                        | 22,23          | 4    | (S)  | (S)  | 6    | 7    | 8    | 7    | 7       | 10      | 9       | 8       |
| Lumber, wood products, and furniture.....        | 24,25          | 5    | 5    | 5    | 6    | 5    | 6    | 16   | 7       | 12      | 10      | 14      |
| Paper and allied products.....                   | 26             | 11   | 11   | 13   | 16   | 17   | 19   | 19   | 15      | 20 (S)  | 20      | 19 (S)  |
| Chemicals and allied products.....               | 28             | 68   | 69   | 69   | 69   | 69   | 71   | 80   | 84      | 78      | 85      | 88      |
| Industrial chemicals.....                        | 281-82,286     | 52   | 54   | 56   | 59   | 60   | 61   | 58   | 63      | 67      | 70      | 65      |
| Drugs and medicines.....                         | 283            | 98   | 94   | 92   | 96   | 95   | 116  | 138  | 141     | 141     | 142     | 143     |
| Other chemicals.....                             | 284-85,287-89  | 61   | 60   | 60   | 53   | 53   | 43   | 51   | 53      | 38      | 49      | 60      |
| Petroleum refining and extraction.....           | 13,29          | 20   | 24   | 26   | 26   | 26   | 27   | 27   | 23      | 26      | 32      | 33      |
| Rubber products.....                             | 30             | 19   | (S)  | 26   | 32   | 38   | 33   | 24   | 21      | 21      | 22      | 24      |
| Stone, clay, and glass products.....             | 32             | 24   | 26   | 26   | 24   | 24   | 23   | 21   | 19      | 22      | 19      | 24 (S)  |
| Primary metals.....                              | 33             | 12   | 12   | 12   | 11   | 11   | 11   | 11   | 14      | 9       | 14      | 13 (S)  |
| Ferrous metals and products.....                 | 331-32,3398-99 | 9    | 9    | 8    | 7    | 7    | 7    | 9    | 7       | 6       | 8       | 13 (S)  |
| Nonferrous metals and products.....              | 333-36         | 16   | 17   | 16   | 15   | (S)  | (S)  | 15   | 23      | 12      | 20      | 13      |
| Fabricated metal products.....                   | 34             | 17   | 17   | (S)  | 20   | 19   | 16   | 21   | 15      | 15      | 17      | 19      |
| Machinery.....                                   | 35             | 67   | 66   | 71   | 73   | 74   | 74   | 61   | 59      | 75      | 67      | 81      |
| Office, computing, and accounting machines.....  | 357            | 115  | 114  | 126  | 131  | 137  | 139  | 124  | 157     | 173     | 163     | 158     |
| Other machinery, except electrical.....          | 351-56,358-59  | 29   | 29   | 31   | 33   | 36   | 37   | 41   | 39      | 55      | 42      | 47      |
| Electrical equipment.....                        | 36             | 65   | 71   | 68   | 66   | 67   | 65   | 75   | 75      | 91      | 98      | 108     |
| Radio and TV receiving equipment.....            | 365            | 45   | 45   | 44   | 30   | 30   | 28   | 51   | 43      | 56      | 55      | 87      |
| Communication equipment.....                     | 366            | 73   | 94   | 96   | 89   | 91   | (S)  | (S)  | 153 (S) | 147 (S) | 163 (S) | 182     |
| Electronic components.....                       | 367            | 86   | 100  | 96   | 89   | 95   | 92   | 122  | 104     | 142 (S) | 137     | 136 (S) |
| Other electrical equipment.....                  | 361-64,369     | 28   | 26   | 30   | 38   | 43   | 44   | 31   | 29      | 38      | 37      | 49      |
| Transportation equipment.....                    | 37             | 68   | 72   | 71   | 68   | 73   | 76   | 70   | 68      | 78      | 83      | 79 (S)  |
| Motor vehicles and motor vehicles equipment..... | 371            | 42   | 41   | 41   | 43   | 49   | 51   | 54   | 50      | 53      | 67      | 63      |
| Other transportation equipment.....              | 373-75,379     | 38   | 40   | 52   | 45   | (S)  | (S)  | (S)  | 43      | 26      | 12      | 35      |
| Aircraft and missiles.....                       | 372,376        | 91   | 103  | 101  | 96   | 98   | 101  | 94   | 108     | 121     | 134     | 106 (S) |

See explanatory information and SOURCE at end of table.

Table A-58. R&amp;D scientists and engineers per 1,000 employees in R&amp;D-performing companies, by industry and size of company: 1987-97

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| Industry and size of company  | SIC code                        | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995    | 1996 | 1997    |
|---|---------------------------------|------|------|------|------|------|------|------|------|---------|------|---------|
| Distribution by industry:   |                                 |      |      |      |      |      |      |      |      |         |      |         |
| Professional and scientific instruments.....                                    | 38                              | 71   | 62   | 59   | 71   | (S)  | (S)  | (S)  | 99   | 100 (S) | 106  | 98 (S)  |
| Scientific and mechanical measuring instruments.....                            | 381-82                          | 85   | 84   | 96   | 95   | (S)  | (S)  | (S)  | 127  | 135 (S) | 145  | 115 (S) |
| Optical, surgical, photographic, and other instruments.....                     | 384-87                          | 63   | 48   | 28   | 17   | (S)  | 59   | 98   | 60   | 64      | 69   | 77      |
| Other manufacturing industries .....  | 27,31,39                        | 18   | 17   | 14   | 14   | 14   | 14   | 32   | 14   | 16      | 49   | 37      |
| Nonmanufacturing <sup>1</sup> .....   |                                 | NA   | 36   | 35      | 36   | 32      |
| Transportation and utilities.....   | 40-42,44-49                     | NA   | 14      | 15   | 4       |
| Communications.....   | 48                              | NA   | 28      | 30   | 8 (S)   |
| Telephone communications.....   | 481                             | NA   | 28      | 29   | 7 (S)   |
| Other communications.....   | 482-484,489                     | NA   | 96      | 74   | 10      |
| Electric, gas, and sanitary services.....                                       | 49                              | NA   | 6 (S)   | 7    | 2       |
| Other transportation and utilities.....   | 40-42,44-47                     | NA   | 1       | 1    | 2       |
| Trade.....  | 50-59                           | NA   | 25      | 25   | 28      |
| Finance, insurance, and real estate.....  | 60-65,67                        | NA   | 13      | 22   | 31 (S)  |
| Services.....   | 701,72,73,75-81,<br>83,84,87,89 | NA   | 75      | 65   | 83      |
| Business services.....  | 73                              | NA   | 64      | 62   | 80      |
| Computer and data processing services.....                                      | 737                             | NA   | 149     | 158  | 201     |
| Other business services.....  | 731-736,738                     | NA   | 4       | 3    | 3       |
| Health services.....  | 80                              | NA   | 35      | 73   | 43      |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | NA   | 38      | 85   | 41      |
| Other health services.....  | 802-805,808-809                 | NA   | 24      | 17   | 59      |
| Engineering and management services.....  | 87                              | NA   | 163     | 89   | 168     |
| Engineering, architectural, and surveying.....                                  | 871                             | NA   | 113 (S) | 129  | 142     |
| Research, development, and testing.....   | 873                             | NA   | 392     | 82   | 289     |
| Other engineering and management services.....                                  | 872,874                         | NA   | 28      | 36   | 67      |

See explanatory information and SOURCE at end of table.

Table A-58. R&amp;D scientists and engineers per 1,000 employees in R&amp;D-performing companies, by industry and size of company: 1987-97

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| Industry and size of company                              | SIC code                     | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997   |
|---|------------------------------|------|------|------|------|------|------|------|------|------|------|--------|
| Other services.....                                       | 701,72,75-79,81,<br>83,84,89 | NA   | 10   | 21   | 16     |
| Other nonmanufacturing industries .....                   | 07-12,14,15,<br>161-162,17   | NA   | 14   | 78   | 78     |
| Distribution by size of company:<br>[Number of employees] |                              |      |      |      |      |      |      |      |      |      |      |        |
| Total <sup>1</sup> .....                                  |                              | NA   | 44   | 47   | 49   | 47     |
| Fewer than 500.....                                       |                              | NA   | 60   | 85   | 97   | 102    |
| 500 to 999.....   |                              | NA   | 42   | 44   | 47   | 52     |
| 1,000 to 4,999.....                                       |                              | NA   | 41   | 45   | 46   | 48     |
| 5,000 to 9,999.....                                       |                              | NA   | 31   | 32   | 40   | 45     |
| 10,000 to 24,999.....                                     |                              | NA   | 31   | 37   | 38   | 37     |
| 25,000 or more.....                                       |                              | NA   | 48   | 45   | 45   | 39 (S) |

<sup>1</sup> Until 1995, this table included only manufacturing companies.

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**KEY:** (S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.  
 NA = Not available.

**NOTES:** The number of R&D scientists and engineers per 1,000 employees for 1995 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1995 and January 1996 by the number of employees in all activities in March 1995. Similar procedures were used for earlier years.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-59. R&D funds per employee in R&D-performing companies, by size of company: 1987-97**

| Size of company<br>[Number of employees]                   | 1987  | 1988  | 1989  | 1990  | 1991  | 1992   | 1993  | 1994  | 1995  | 1996   | 1997   |
|--|-------|-------|-------|-------|-------|--------|-------|-------|-------|--------|--------|
| Total (company, Federal, and other) R&D funds per employee |       |       |       |       |       |        |       |       |       |        |        |
| Total.....   | 5,338 | 5,594 | 5,920 | 6,291 | 6,842 | 7,366  | 7,225 | 6,945 | 7,439 | 7,992  | 7,791  |
| Fewer than 500.....  | 5,553 | 5,377 | 5,660 | 6,339 | 7,279 | 7,493  | 8,718 | 6,041 | 8,611 | 11,056 | 12,183 |
| 500 to 999.....  | 3,121 | 2,906 | 3,197 | 3,826 | (T)   | 14,206 | 5,184 | 5,043 | 5,620 | 5,755  | 6,287  |
| 1,000 to 4,999.....  | 3,395 | 3,223 | 3,404 | 3,738 | 4,243 | 4,907  | 5,046 | 5,377 | 6,201 | 6,439  | 6,849  |
| 5,000 to 9,999.....  | 3,210 | 3,992 | 4,158 | 4,456 | 4,706 | 5,253  | 5,379 | 4,771 | 4,975 | 5,652  | 6,331  |
| 10,000 to 24,999.....                                      | 3,668 | 3,713 | 3,607 | 4,401 | 5,223 | 5,468  | 5,294 | 5,406 | 6,445 | 7,375  | 6,747  |
| 25,000 or more.....  | 7,035 | 7,388 | 7,863 | 8,005 | 8,252 | 8,908  | 9,123 | 9,305 | 8,738 | 8,890  | 7,990  |
| Company and other (except Federal) R&D funds per employee  |       |       |       |       |       |        |       |       |       |        |        |
| Total.....   | 3,562 | 3,844 | 3,607 | 4,401 | 5,322 | 5,839  | 5,834 | 5,682 | 6,118 | 6,685  | 6,608  |
| Fewer than 500.....  | 4,811 | 4,782 | 5,201 | 5,701 | 6,242 | 6,384  | 7,828 | 5,559 | 7,589 | 9,800  | 11,065 |
| 500 to 999.....  | 2,859 | 2,677 | 3,029 | 3,598 | (T)   | 13,937 | 4,871 | 4,792 | 5,350 | 5,484  | 5,810  |
| 1,000 to 4,999.....  | 2,799 | 2,761 | 2,990 | 3,346 | 3,817 | 4,488  | 4,623 | 5,094 | 5,910 | 6,259  | 6,660  |
| 5,000 to 9,999.....  | 2,682 | 3,335 | 3,624 | 4,286 | 4,228 | 4,764  | 4,935 | 4,625 | 4,848 | 5,423  | 6,059  |
| 10,000 to 24,999.....                                      | 2,969 | 3,163 | 3,217 | 3,863 | 4,106 | 4,282  | 4,400 | 4,622 | 5,710 | 6,998  | 6,461  |
| 25,000 or more.....  | 4,010 | 4,402 | 5,016 | 5,251 | 5,739 | 6,404  | 6,691 | 6,783 | 6,363 | 6,455  | 5,884  |

KEY: (T) = Data not separately available.

NOTES: Averages were derived by dividing total and company R&D funds for a calendar year by employment data for March of that year.

As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table A-60. Concentration of total employment in R&D-performing companies ranked by size of R&D program: 1987-97**

| Companies ranked by size of R&D program | 1987      | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|-----------|------|------|------|------|------|------|------|------|------|------|
|   | [Percent] |      |      |      |      |      |      |      |      |      |      |
| First 4 (1-4).....                      | 7         | 7    | 7    | 7    | 7    | 7    | 6    | 6    | 6    | 6    | 5    |
| Next 4 (5-8).....                       | 4         | 3    | 3    | 3    | 3    | 3    | 2    | 2    | 2    | 2    | 2    |
| Next 12 (9-20).....                     | 6         | 6    | 6    | 5    | 5    | 5    | 5    | 4    | 4    | 4    | 3    |
| Next 20 (21-40).....                    | 6         | 5    | 4    | 5    | 4    | 4    | 4    | 4    | 4    | 4    | 4    |
| Next 60 (41-100).....                   | 8         | 9    | 10   | 9    | 9    | 8    | 8    | 7    | 7    | 7    | 6    |
| Next 100 (101-200).....                 | 7         | 8    | 8    | 8    | 10   | 9    | 9    | 8    | 7    | 8    | 6    |
| Next 200 (201-400).....                 | 9         | 9    | 9    | 11   | 10   | 10   | 10   | 9    | 9    | 9    | 11   |
| All others.....                         | 53        | 53   | 53   | 52   | 52   | 47   | 55   | 59   | 61   | 59   | 63   |

**NOTE:** As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

# SECTION B. TECHNICAL NOTES

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# SURVEY METHODOLOGY<sup>1</sup>

## REPORTING UNIT

The reporting unit for the Survey of Industrial Research and Development is the company, defined as a business organization of one or more establishments under common ownership or control. The survey includes two groups of enterprises: (1) companies known to conduct R&D, and (2) a sample representation of companies for which information on the extent of R&D activity is uncertain.

## FRAME CREATION

The Standard Statistical Establishment List, a Bureau of the Census compilation that contains information on more than 3 million establishments with paid employees, was the target population from which the frame used to select the 1997 survey sample was created (see table B-1 for target population and sample sizes). For companies with more than one establishment, data were summed to the company level. Each firm was then assigned a single SIC code based on the activity of the establishment having the highest dollar value of payroll. This assignment was done on a hierarchical basis. The enterprise was first assigned to the economic division (manufacturing or nonmanufacturing) with the highest payroll, then to the 2-digit SIC code with the highest payroll within the assigned division, then to the 3-digit SIC code with the highest payroll within the assigned 2-digit industry.

The frame from which the survey sample was drawn included all for-profit companies classified in nonfarm industries. For surveys prior to 1992, the frame was limited to companies above certain size criteria based on number of employees.<sup>2</sup> These criteria varied by industry. Some industries were excluded from the frame because it was believed that they contributed little or no R&D activity to the final survey estimates. For the 1992 sample, new industries were added to the frame,<sup>3</sup> and the size

criteria were lowered considerably and applied uniformly to firms in all industries. As a result, nearly 2 million enterprises with 5 or more employees were given a chance of selection. For comparison, the frame for the 1987 sample included 154,000 companies of specified sizes and industries. The frame used to select the 1997 sample was similar to those used to select the 1992–96 samples.

## DEFINING SAMPLING STRATA

A fundamental change initiated in 1995 and repeated for the 1996 and 1997 samples was the redefinition of the sampling strata. For the survey years 1992–94, 165 sampling strata were established, each stratum corresponding to one or more 3-digit-level SIC codes. The objective was to select sufficient representation of industries to determine whether alternative or expanded publication levels were warranted. For the 1997 survey, the strata were defined to correspond to publication-level industry aggregations, and companies were assigned to strata based on their 3-digit SIC codes. A total of 40 such levels were defined, corresponding to the original 25 groupings of manufacturing industries used as strata in sample designs before 1992 and to 15 new groupings of nonmanufacturing industries.

## IDENTIFYING CERTAINTY COMPANIES

The criteria for identifying companies selected with certainty for the survey have been modified since 1994. With a fixed total sample size, there was some concern that representation of the very large noncertainty universe by a smaller sample each year would be inadequate. Before 1994, companies with 1,000 or more employees had been selected with certainty, but it was observed that the level of spending varied considerably and that many of these companies reported no R&D expenditures each year. Beginning in 1995, these companies were thus given chances of selection based only upon the size of their R&D spending if they were in the previous survey or upon an estimated R&D value if they were not. To further limit the growth in the number of certainty cases occurring each year, the certainty criterion—the size of their R&D spending—was raised for the 1996 survey from \$1 million to \$5 million; it remained at that level for the 1997 survey.

<sup>1</sup> Information for this section was provided by the Manufacturing and Construction Division of the U.S. Bureau of Census, which collected and compiled these survey data for NSF. Copies of the technical papers cited can be obtained from NSF's Research and Development Statistics Program in the Division of Science Resources Studies.

<sup>2</sup> See U.S. Bureau of Census (1994d).

<sup>3</sup> These industries are listed and discussed later under "Comparability of Statistics."

## FRAME PARTITIONING

The partitioning of the frame into “large” and “small” company components and the use of simple random sampling (SRS) for the small company partition were first introduced in the 1994 survey. A study of 1992 survey results showed that a disproportionate number of small companies were being selected for the sample, often with very large weights. These small companies seldom reported R&D activity. This disproportion was a result of the minimum probability rule (discussed later) used as part of the independent probability proportionate to size (PPS) sampling procedure, which was the only procedure used prior to 1994. This rule increased the probability of selection for several hundred thousand of these smaller companies. With SRS, these smaller companies can be sampled more efficiently than with independent PPS sampling since there is little variability in their size.

For 1995, total company payroll was the basis for the split between large and small partitions. For each industry grouping, the largest companies representing the top 90 percent of the total payroll were included in the PPS frame. The balance of smaller companies comprising the remaining 10 percent of payroll for the industry grouping were included in the SRS frame. A benefit of this design change was a reduction in the maximum allowable weight for selected companies (weighting and maximum weights are discussed later).

For 1996 and 1997, total company employment was the basis for partitioning the frame. The total company employment levels defining the partitions were based on the relative contribution to total R&D expenditures of companies in different employment size groups in both the manufacturing and nonmanufacturing sectors. In the manufacturing sector, all companies with total employment of 50 or more were included in the large company partition. In the nonmanufacturing sector, all companies with total employment of 15 or more were included in the large company partition. Companies in the respective sectors with employment below these values were included in the small company partition. In the 1997 survey, the large company partition contained about 540,000 companies; the small company partition contained about 1.3 million companies. These counts were comparable to those in the 1995 (656,000 and 1.2 million, respectively) and 1996 (560,000 and 1.3 million, respectively) partitions.

## IDENTIFYING “ZERO” INDUSTRIES

One final modification in frame development for 1996, which was repeated for 1997, was the designation of “zero industries” in the large company partition. Zero industries were those 3-digit SIC industries having no R&D expenditures reported in the survey years 1992–94—the years when estimates by 3-digit SIC industry were formed. It was decided to keep these industries in the scope of the survey but to draw only a limited sample from them, since it seemed unlikely that R&D expenditures would be reported. SRS was used to control the number of companies selected within these industries.

## SAMPLE SELECTION

A significant revision in the procedure for selecting samples from the partitions changed the development and presentation of estimates from the 1996 survey; this approach was repeated for the 1997 survey. A sample of companies in the large company partition was selected using PPS sampling in each of the 40 strata as in 1995. The sample of companies in the small company partition was selected using SRS in only 2 strata rather than 40 as in 1995. Companies classified in manufacturing industries were selected to represent the group of all manufacturing industries rather than each manufacturing industry group. Similarly, companies classified in nonmanufacturing industries were selected to represent the group of all nonmanufacturing industries.

The purpose of selecting small companies from only two strata was to reduce the variability in industry estimates attributed to the random year-to-year selection of the companies in an industry and the associated high sampling weights. Consequently, estimates for individual industry groups are not possible from these two strata.<sup>4</sup> Statistics for the detailed industry groups are based only on the sample from the large company partition. Estimates from the small company partition are included in statistics for total manufacturing, total nonmanufacturing, and all industries. For completeness, the estimates also are added to the categories “other manufacturing” and “other nonmanufacturing.”

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<sup>4</sup> However, estimates for companies in these groups *are* included with their less detailed 2-digit SIC classifications in one table (table A-2). In all other tables, they are added to the “other manufacturing” and “other nonmanufacturing” classifications.

Table B-1. Number of companies in the target population and selected for the sample, by industry: 1997

Page 1 of 3

| Industry  | SIC code       | Companies<br>in target<br>population | 1997 survey                              |                             |                          | Companies reporting<br>R&D expenditures for 1997 <sup>3</sup> |                          | Companies<br>reporting no<br>R&D expenditures<br>for 1997 <sup>4</sup> |
|---|----------------|--------------------------------------|--|-----------------------------|--------------------------|---|--------------------------|--|
|   |                |                                      | Companies<br>selected for<br>1997 sample | Noncertainties <sup>1</sup> | Certainties <sup>2</sup> | Greater than or<br>equal to \$1 million                       | Less than<br>\$1 million |  |
| All Industries.....                                 |                | 1,817,224                            | 23,417                                   | 20,507                      | 2,910                    | 2,812   | 929                      | 15,970   |
| Manufacturing.....                                  |                | 189,759                              | 4,655                                    | 3,230                       | 1,425                    | 1,618   | 506                      | 1,906  |
| Food, kindred, and tobacco products .....           | 20,21          | 2,583                                | 159                                      | 97                          | 62                       | 72  | 25                       | 54   |
| Textiles and apparel.....                           | 22,23          | 3,542                                | 187                                      | 118                         | 69                       | 52  | 33                       | 77   |
| Lumber, wood products, and furniture.....           | 24,25          | 3,325                                | 171                                      | 125                         | 46                       | 32  | 36                       | 84   |
| Paper and allied products.....                      | 26             | 1,190                                | 97                                       | 56                          | 41                       | 46  | 9                        | 32   |
| Chemicals and allied products.....                  | 28             | 1,241                                | 248                                      | 83                          | 165                      | 185   | 19                       | 20   |
| Industrial chemicals.....                           | 281-82,286     | 304                                  | 72                                       | 14                          | 58                       | 64  | 2                        | 3  |
| Drugs and medicines.....                            | 283            | 274                                  | 53                                       | 4                           | 49                       | 49  | 3                        | 1  |
| Other chemicals.....                                | 284 85,287 89  | 663                                  | 123                                      | 65                          | 58                       | 72  | 14                       | 16   |
| Petroleum refining and extraction.....              | 13,29          | 2,000                                | 56                                       | 38                          | 18                       | 21  | 0                        | 29   |
| Rubber products.....                                | 30             | 2,620                                | 281                                      | 174                         | 107                      | 109   | 55                       | 77   |
| Stone, clay, and glass products.....                | 32             | 1,241                                | 64                                       | 37                          | 27                       | 33  | 5                        | 22   |
| Primary metals.....                                 | 33             | 1,247                                | 98                                       | 46                          | 52                       | 60  | 12                       | 22   |
| Ferrous metals and products.....                    | 331 32,3398 99 | 658                                  | 41                                       | 20                          | 21                       | 26  | 6                        | 9  |
| Nonferrous metals and products.....                 | 333 36         | 589                                  | 57                                       | 26                          | 31                       | 34  | 6                        | 13   |
| Fabricated metal products.....                      | 34             | 4,604                                | 407                                      | 284                         | 123                      | 124   | 82                       | 144  |
| Machinery.....                                      | 35             | 4,684                                | 335                                      | 164                         | 171                      | 238   | 33                       | 39   |
| Office, computing, and accounting machines....      | 357            | 4,381                                | 273                                      | 156                         | 117                      | 56  | 1                        | 1  |
| Other machinery, except electrical.....             | 351 56,358 59  | 303                                  | 62                                       | 8                           | 54                       | 182   | 32                       | 38   |
| Electrical equipment.....                           | 36             | 2,827                                | 361                                      | 127                         | 234                      | 279   | 32                       | 20   |
| Radio and TV receiving equipment.....               | 365            | 103                                  | 20                                       | 4                           | 16                       | 15  | 2                        | 0  |
| Communication equipment.....                        | 366            | 361                                  | 82                                       | 14                          | 68                       | 73  | 4                        | 2  |
| Electronic components.....                          | 367            | 1,243                                | 134                                      | 42                          | 92                       | 105   | 13                       | 6  |
| Other electrical equipment.....                     | 361 64,369     | 1,120                                | 125                                      | 67                          | 58                       | 86  | 13                       | 12   |
| Transportation equipment.....                       | 37             | 1,438                                | 84                                       | 21                          | 63                       | 61  | 6                        | 9  |
| Motor vehicles and motor vehicles<br>equipment..... | 371            | 752                                  | 41                                       | 12                          | 29                       | 28  | 6                        | 4  |
| Other transportation equipment.....                 | 373 75,379     | 448                                  | 15                                       | 6                           | 9                        | 9   | 0                        | 2  |
| Aircraft and missiles.....                          | 372,376        | 238                                  | 28                                       | 3                           | 25                       | 24  | 0                        | 3  |

See explanatory information and SOURCE at end of table.

Table B-1. Number of companies in the target population and selected for the sample, by industry: 1997

Page 2 of 3

| Industry  | SIC code                        | Companies in target population | 1997 survey                        |                             |                          | Companies reporting R&D expenditures for 1997 <sup>3</sup> |                       | Companies reporting no R&D expenditures for 1997 <sup>4</sup> |
|---|---------------------------------|--------------------------------|------------------------------------|-----------------------------|--------------------------|--|-----------------------|---|
|   |                                 |                                | Companies selected for 1997 sample | Noncertainties <sup>1</sup> | Certainties <sup>2</sup> | Greater than or equal to \$1 million                       | Less than \$1 million |   |
| Professional and scientific instruments.....                                    | 38                              | 1,340                          | 342                                | 182                         | 160                      | 235  | 37                    | 22  |
| Scientific and mechanical measuring instruments.....                            | 381 82                          | 687                            | 203                                | 114                         | 89                       | 139  | 30                    | 10  |
| Optical, surgical, photographic, and other instruments.....                     | 384 87                          | 653                            | 139                                | 68                          | 71                       | 96   | 7                     | 12  |
| Other manufacturing industries <sup>b</sup> .....                               | 27,31,39                        | 155,877                        | 1,765                              | 1,678                       | 87                       | 71   | 122                   | 1,255   |
| Nonmanufacturing .....  |                                 | 1,627,465                      | 18,762                             | 17,277                      | 1,485                    | 1,194  | 423                   | 14,064  |
| Transportation and utilities.....   | 40 42,44 49                     | 29,003                         | 896                                | 731                         | 165                      | 71   | 35                    | 648   |
| Communications.....   | 48                              | 3,696                          | 320                                | 233                         | 87                       | 17   | 9                     | 236   |
| Telephone communications.....   | 481                             | 1,135                          | 32                                 | 21                          | 11                       | 9  | 1                     | 19  |
| Other communications.....   | 482 484,489                     | 2,561                          | 288                                | 212                         | 76                       | 8  | 8                     | 217   |
| Electric, gas, and sanitary services.....                                       | 49                              | 1,420                          | 121                                | 59                          | 62                       | 40   | 21                    | 48  |
| Other transportation and utilities.....   | 40 42,44 47                     | 23,887                         | 455                                | 439                         | 16                       | 14   | 5                     | 364   |
| Trade.....  | 50 59                           | 231,574                        | 4,736                              | 4,629                       | 107                      | 122  | 70                    | 3,729   |
| Finance, insurance, and real estate.....  | 60 65,67                        | 36,230                         | 835                                | 764                         | 71                       | 42   | 8                     | 669   |
| Services.....   | 701,72,73,75 81,<br>83,84,87,89 | 171,420                        | 6,022                              | 4,946                       | 1,076                    | 928  | 249                   | 3,947   |
| Business services.....  | 73                              | 41,166                         | 1,508                              | 1,164                       | 344                      | 396  | 67                    | 785   |
| Computer and data processing services.....                                      | 737                             | 7,972                          | 763                                | 466                         | 297                      | 371  | 52                    | 209   |
| Other business services.....  | 731 736,738                     | 33,194                         | 745                                | 698                         | 47                       | 25   | 15                    | 576   |
| Health services.....  | 80                              | 37,361                         | 827                                | 785                         | 42                       | 17   | 16                    | 674   |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                     | 19,191                         | 476                                | 440                         | 36                       | 11   | 15                    | 385   |
| Other health services.....  | 802 805,808 809                 | 18,170                         | 351                                | 345                         | 6                        | 6  | 1                     | 289   |

See explanatory information and SOURCE at end of table.

Table B-1. Number of companies in the target population and selected for the sample, by industry: 1997

Page 3 of 3

| Industry   | SIC code                     | Companies in target population | 1997 survey                        |                             |                          | Companies reporting R&D expenditures for 1997 <sup>3</sup> |                       | Companies reporting no R&D expenditures for 1997 <sup>4</sup> |
|--|------------------------------|--------------------------------|------------------------------------|-----------------------------|--------------------------|--|-----------------------|---|
|  |                              |                                | Companies selected for 1997 sample | Noncertainties <sup>1</sup> | Certainties <sup>2</sup> | Greater than or equal to \$1 million                       | Less than \$1 million |   |
| Engineering and management services.....             | 87                           | 22,979                         | 2,440                              | 1,772                       | 668                      | 499  | 155                   | 1,498   |
| Engineering, architectural, and surveying....        | 871                          | 8,694                          | 1,235                              | 923                         | 312                      | 155  | 110                   | 849   |
| Research, development, and testing.....              | 873                          | 2,831                          | 722                                | 419                         | 303                      | 328  | 34                    | 258   |
| Other engineering and management services.....       | 872,874                      | 11,454                         | 483                                | 430                         | 53                       | 16   | 11                    | 391   |
| Other services.....                                  | 701,72,75 79,81,<br>83,84,89 | 69,914                         | 1,247                              | 1,225                       | 22                       | 16   | 11                    | 990   |
| Other nonmanufacturing industries <sup>5</sup> ..... | 07 12,14,15,<br>161 162,17   | 1,159,238                      | 6,273                              | 6,207                       | 66                       | 31   | 61                    | 5,071   |

<sup>1</sup> Non-certainties are companies whose probability of selection is less than one.<sup>2</sup> Certainties are companies whose probability of selection is one. This includes companies whose 1996 R&D expenditures are equal to or greater than \$5 million.<sup>3</sup> This includes R&D-1L companies for which total R&D expenditure data were imputed.<sup>4</sup> Does not include companies that did not respond to the survey or that did not indicate any information about R&D performance on a returned questionnaire.<sup>5</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

## PROBABILITY PROPORTIONATE TO SIZE

For 1995, the distribution of companies by payroll and estimated R&D in the large partition of the sample was skewed as in earlier frames. Because of this skewness, PPS sampling used in previous designs was an appropriate selection technique for this group. That is, large companies had a higher probability of selection than did small companies. It would have been ideal if company size could have been determined by its R&D expenditures. Unfortunately, except for the companies that were in a previous survey or for which there was information from external sources, it was impossible to know the R&D expenditures for every firm in the universe. Consequently, the probability of selection for most companies was based on estimated R&D expenditures.

**Imputing R&D.** Since total payroll was known for each company in the universe, it was possible for the 1997 survey to estimate R&D from payroll using relationships derived from 1996 survey data. Imputation factors relating these two variables were made for each industry grouping. To impute R&D for a given company, the imputation factors were applied to the company payroll in each industry grouping. A final measure was obtained by adding the industry grouping components. The effect, in general, was to give firms with large payrolls higher probabilities of selection in accordance with the assumption that larger companies were more likely to perform R&D.

Estimated R&D values were computed for companies in the small company partition as well. The aggregate of reported and estimated R&D from each company in both the large and small company partitions represented a total universe measure of 1996 R&D expenditures. However, assigning a value for R&D to every company resulted in an overstatement of this measure. To adjust for the overstatement, the universe measure for the 1997 survey was scaled down using factors developed from the relationship of the frame measure of 1996 R&D and the 1996 survey estimate. These factors, computed at levels corresponding to published industry levels, were used to adjust originally imputed R&D values so that the new frame total for R&D at these levels approximated the 1996 published values. This adjustment provided for better allocation of the sample among these levels.

## SIMPLE RANDOM SAMPLING

Only two major strata were defined for samples in the small company partition—manufacturing and nonmanufacturing. The use of SRS implied that each

company within a stratum had an equal probability of selection. The total sample allocated to the small company partition was dependent upon the total sample specified for the survey and upon the total sample necessary to satisfy criteria established for the large company partition. Once determined, the allocation of this total by stratum was made proportionate to the stratum's payroll contribution to the entire partition.

## SAMPLE STRATIFICATION AND RELATIVE STANDARD ERROR CONSTRAINTS

The particular sample selected for each survey year was one of a large number of the same type and size that by chance might have been selected. Statistics resulting from the different samples would differ somewhat from each other. These differences are represented by estimates of sampling error. The smaller the sampling error, the more precise the statistic.

**Controlling Sampling Error.** The large company partition was of primary concern, since it was believed that nearly all of the R&D activity would be identified from this sector. To control sampling error in the statistics resulting from this portion of the frame, parameters were specified to allocate the sample across various levels, or strata, that corresponded to the 40 industry groupings discussed earlier. These parameters determined the sample size required to achieve a desired level of sampling error for each stratum and were assigned so that estimated errors of total R&D expenditures for industries in these strata did not exceed certain levels. Sample sizes among the strata were constrained only by the limit placed on the total sample size dictated by the available budget.

**Sampling Strata and Standard Error Estimates.** The practice, first implemented in the 1995 survey and continued in the 1996 and 1997 surveys, of establishing sampling strata corresponding to published industry groupings meant that more efficient samples could be selected for these groups than had resulted when using the 165-strata design. Even the expansion of the number of nonmanufacturing publication groupings resulted in fewer sampling strata. The earlier designs defined 25 strata of 3-digit-SIC manufacturing industries, but published only one category of nonmanufacturing industry. Beginning with the 1995 sample design, 15 nonmanufacturing strata were defined for sampling and publication levels. Since there was no mandate in any ensuing year to make a major reduction in the sample of 17,600 companies for the large company partition selected under the 165-strata design, it was possible to establish much

tighter relative standard error constraints on the smaller number of sampling strata. Thus, in 1997, 33 strata were assigned a relative standard error constraint of 1 percent, while 7 strata were assigned a relative standard error constraint of 0.5 percent. These constraints resulted in an expected sample size of about 8,276 companies from the large company partition. The minimum probability rule (discussed later) was adjusted so as to raise the expected sample size closer to the 17,000 level.

A limitation of the sample allocation process for the large partition should be noted. The sampling errors used to control the sample size in each stratum are based on a universe total that, in large part, was improvised. That is, as previously noted, an R&D value was assigned to every company in the frame, even though most of these companies actually may not have had R&D expenditures. The value assigned was imputed for the majority of companies in the frame, and—as a consequence—the estimated universe total and the distribution of individual company values, even after scaling, did not necessarily reflect the true distribution. Estimates of sampling variability were nevertheless based on this distribution. The presumption was that actual variation in the sample design would be less than that estimated, because many of the sampled companies have true R&D values of zero, not the widely varying values that were imputed using total payroll as a predictor of R&D. Previous sample selections indicate that in general this presumption holds, but exceptions have occurred when companies with large sampling weights have reported large amounts of R&D spending. Thus, in general, the 1 percent and 0.5 percent error levels described earlier are conservative. See table B-2 for the actual standard error estimates for selected items by industry.

For the 1995 small company partition, 40 strata were identified. Also included was a separate stratum of approximately 6,260 companies that could not be classified into an SIC code and therefore could not be assigned to a stratum because of incomplete industry identification in the Standard Statistical Establishment List. As was done for 1994, a small number of companies was selected from this group in the hopes that an accurate industry identification could be obtained at a later point. The initial sample size specified for the small company partition was 5,500 companies. The sample initially allocated to a given stratum was proportionate to its share of total payroll for the small partition. For the 1996 and 1997 small company partitions, two strata (manufacturing and nonmanufacturing) were identified, and a small

number of companies was selected from the group of unclassifiable companies. For 1997, a final sample of 6,445 companies was selected from the small company partition. The sample initially allocated to the two strata was proportionate to its share of total payroll for the small company partition.

**Nonsampling Error.** In addition to sampling error, estimates are subject to nonsampling error. Errors are grouped in five categories: specification, coverage, response, nonresponse, and processing. For detailed discussions on the sources, control, and measurement of each of these types of error, see U.S. Bureau of the Census (1994b and 1994f).

## SAMPLE SIZE

The target sample size initially specified for the 1997 survey was 25,000 companies and, as described above, was based primarily on compliance with predetermined sampling error constraints established for the large partition. The actual sample size was 23,417 companies. The sample differed from the target for several reasons.

**Independent Sampling.** First, the frame for the large company partition was subjected to independent sampling. Each company in the frame had an independent chance of selection based on its assigned probability—i.e., selection of a company was completely independent of the selection of any other company. In independent (or Poisson) sampling, sample size itself is a random variable, and the actual sample size will vary around the target or “expected” sample size. Theoretically, a sample of size zero or a sample the size of the entire universe is possible, but the probabilities of these extremes are so small that these are improbable situations. In strata where the expected sample size is more than 50, the actual sample probably will be within a fairly narrow range so that increased variability is not a real problem. However, in strata where the expected sample is small (i.e., less than 10), gross over- or undersampling of the strata is possible. In practice, the size of the originally drawn sample is usually quite close to the specified size. If there is too much deviation, however, the selection can be repeated until it is closer to the target.

**Minimum Probability Rule.** Second, a minimum probability rule was imposed for both partitions in the sample. As noted earlier, for the large company partition, probabilities of selection proportionate to size were assigned each company, where size is the reported or imputed R&D value assigned to each company. Selected

Table B-2. Relative standard error for selected estimates, by industry and size of company: 1997

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| Industry and size of company              | SIC code           | Number of R&D-performing companies | Domestic net sales of R&D performers | Domestic employment of R&D performers | Number of FTE scientists and engineers | Total R&D | Company and other funds for R&D | Company-financed R&D performed outside of U.S. | Company-financed R&D contracted to outside organizations | Federal funds for R&D | Total funds for basic research | Total funds for applied research | Total funds for development |
|---|--------------------|------------------------------------|--------------------------------------|---------------------------------------|--|-----------|---------------------------------|--|--|-----------------------|--------------------------------|----------------------------------|-----------------------------|
|   |                    |                                    | [Percent]                            |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| All Industries.....                       |                    | 3,741                              | 3.6                                  | 8.8                                   | 1.4                                    | 1.0       | 1.2                             | 0.4  | 4.3  | 1.0                   | 5.5                            | 3.2                              | 1.1                         |
| Distribution by industry:                 |                    |                                    |                                      |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Manufacturing.....                        |                    | 2,124                              | 2.2                                  | 1.7                                   | 1.1                                    | 0.7       | 0.9                             | 0.3  | 2.4  | 0.8                   | 1.6                            | 2.8                              | 0.9                         |
| Food, kindred, and tobacco products ..... | 20,21              | 97                                 | 5.5                                  | 10.8                                  | 8.7                                    | 7.0       | 7.0                             | 0.5  | 4.6  | 0.0                   | 38.1                           | 3.2                              | 10.7                        |
| Textiles and apparel.....                 | 22,23              | 85                                 | 5.7                                  | 5.9                                   | 8.4                                    | 2.6       | 2.7                             | 0.4  | 41.2   | 0.0                   | 20.9                           | 11.7                             | 2.3                         |
| Lumber, wood products, and furniture..... | 24,25              | 68                                 | 8.5                                  | 8.8                                   | 19.0                                   | 10.9      | 10.9                            | 0.0  | 1.1  | 0.0                   | 8.3                            | 5.0                              | 13.7                        |
| Paper and allied products.....            | 26                 | 55                                 | 2.1                                  | 2.6                                   | 2.0                                    | 1.2       | 1.2                             | 0.0  | 8.5  | 0.0                   | 0.2                            | 3.3                              | 5.6                         |
| Chemicals and allied products.....        | 28                 | 204                                | 1.8                                  | 1.8                                   | 0.9                                    | 0.5       | 0.5                             | 0.0  | 0.2  | 0.0                   | 1.3                            | 1.2                              | 0.5                         |
| Industrial chemicals.....                 | 281-82,286         | 66                                 | 3.5                                  | 2.6                                   | 2.2                                    | 0.8       | 0.9                             | 0.0  | 2.4  | 0.0                   | 4.7                            | 1.4                              | 0.6                         |
| Drugs and medicines.....                  | 283                | 52                                 | 1.7                                  | 3.7                                   | 0.8                                    | 0.5       | 0.5                             | 0.0  | 0.3  | 0.0                   | 0.0                            | 2.0                              | 0.2                         |
| Other chemicals.....                      | 284-85,<br>287-89  | 86                                 | 3.5                                  | 2.8                                   | 2.0                                    | 2.5       | 2.5                             | 0.0  | 0.2  | 0.0                   | 13.8                           | 1.3                              | 4.1                         |
| Petroleum refining and extraction.....    | 13,29              | 21                                 | 16.3                                 | 4.9                                   | 1.0                                    | 0.5       | 0.5                             | 0.0  | 0.0  | 0.0                   | 0.0                            | 0.8                              | 1.0                         |
| Rubber products.....                      | 30                 | 164                                | 24.8                                 | 4.6                                   | 10.5                                   | 2.5       | 2.5                             | 2.4  | 1.1  | 0.0                   | 5.0                            | 7.9                              | 3.4                         |
| Stone, clay, and glass products.....      | 32                 | 38                                 | 3.4                                  | 4.4                                   | 4.0                                    | 0.8       | 0.8                             | 0.4  | 0.0  | 0.0                   | 6.1                            | 0.3                              | 1.0                         |
| Primary metals.....                       | 33                 | 72                                 | 14.1                                 | 13.7                                  | 11.4                                   | 12.9      | 13.9                            | 2.7  | 3.6  | 10.2                  | 20.5                           | 2.7                              | 30.3                        |
| Ferrous metals and products.....          | 331-32,<br>3398-99 | 32                                 | 13.3                                 | 20.7                                  | 18.0                                   | 20.2      | 25.7                            | 0.0  | 7.9  | 10.5                  | 0.0                            | 2.3                              | 43.2                        |
| Nonferrous metals and products.....       | 333-36             | 40                                 | 26.5                                 | 13.7                                  | 6.5                                    | 2.8       | 2.9                             | 4.4  | 0.0  | 0.0                   | 22.9                           | 5.0                              | 5.9                         |
| Fabricated metal products.....            | 34                 | 206                                | 3.6                                  | 4.2                                   | 10.8                                   | 9.2       | 6.1                             | 0.6  | 30.3   | 64.7                  | 26.9                           | 46.8                             | 8.6                         |

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error for selected estimates, by industry and size of company: 1997

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| Industry and size of company                                | SIC code          | Number of R&D-performing companies | Domestic net sales of R&D performers | Domestic employment of R&D performers | Number of FTE scientists and engineers | Total R&D | Company and other funds for R&D | Company-financed R&D performed outside of U.S. | Company-financed R&D contracted to outside organizations | Federal funds for R&D | Total funds for basic research | Total funds for applied research | Total funds for development |
|---|-------------------|------------------------------------|--------------------------------------|---------------------------------------|--|-----------|---------------------------------|--|--|-----------------------|--------------------------------|----------------------------------|-----------------------------|
|   |                   |                                    | [Percent]                            |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Distribution by industry:                                   |                   |                                    |                                      |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Machinery.....  | 35                | 271                                | 3.8                                  | 3.7                                   | 3.8                                    | 3.1       | 3.1                             | 1.8  | 13.8   | 2.7                   | 11.6                           | 12.9                             | 3.5                         |
| Office, computing, and accounting machines.....             | 357               | 57                                 | 6.8                                  | 3.8                                   | 5.9                                    | 4.0       | 4.0                             | 0.0  | 0.0  | 0.0                   | 0.0                            | 16.0                             | 4.8                         |
| Other machinery, except electrical.....                     | 351-56,<br>358-59 | 214                                | 4.3                                  | 5.0                                   | 3.5                                    | 4.5       | 4.5                             | 5.2  | 29.4   | 5.4                   | 17.6                           | 15.7                             | 5.1                         |
| Electrical equipment.....                                   | 36                | 311                                | 4.6                                  | 4.6                                   | 2.4                                    | 2.0       | 2.1                             | 1.6  | 13.2   | 3.2                   | 4.4                            | 3.3                              | 3.0                         |
| Radio and TV receiving equipment.....                       | 365               | 17                                 | 1.3                                  | 3.6                                   | 0.5                                    | 0.9       | 0.9                             | 0.0  | 0.0  | 0.0                   | 0.0                            | 7.6                              | 0.6                         |
| Communication equipment.....                                | 366               | 77                                 | 19.2                                 | 17.0                                  | 4.8                                    | 4.9       | 5.4                             | 3.9  | 26.9   | 0.5                   | 3.3                            | 12.4                             | 4.6                         |
| Electronic components.....                                  | 367               | 118                                | 3.1                                  | 5.1                                   | 3.1                                    | 2.2       | 2.3                             | 0.3  | 38.1   | 1.3                   | 10.9                           | 2.1                              | 7.2                         |
| Other electrical equipment.....                             | 361-64,369        | 99                                 | 1.8                                  | 3.6                                   | 3.9                                    | 2.2       | 2.0                             | 2.0  | 1.4  | 12.3                  | 6.4                            | 4.5                              | 2.9                         |
| Transportation equipment.....                               | 37                | 67                                 | 2.6                                  | 2.5                                   | 0.8                                    | 0.3       | 0.6                             | 0.0  | 0.4  | 0.0                   | 0.1                            | 0.6                              | 0.4                         |
| Motor vehicles and motor vehicles equipment.....            | 371               | 34                                 | 3.8                                  | 4.4                                   | 1.9                                    | 0.7       | 0.8                             | 0.0  | 0.4  | 0.0                   | 0.6                            | 1.9                              | 0.8                         |
| Other transportation equipment.....                         | 373-75,379        | 9                                  | 2.5                                  | 7.6                                   | 0.0                                    | 1.3       | 2.7                             | 0.0  | 0.0  | 0.0                   | 0.0                            | 0.0                              | 2.6                         |
| Aircraft and missiles.....                                  | 372,376           | 24                                 | 0.0                                  | 0.0                                   | 0.0                                    | 0.0       | 0.0                             | 0.0  | 0.0  | 0.0                   | 0.0                            | 0.0                              | 0.0                         |
| Professional and scientific instruments.....                | 38                | 272                                | 1.3                                  | 1.4                                   | 1.4                                    | 0.7       | 1.1                             | 0.3  | 21.0   | 0.2                   | 3.1                            | 5.3                              | 0.7                         |
| Scientific and mechanical measuring instruments.....        | 381-82            | 169                                | 1.7                                  | 1.8                                   | 1.5                                    | 1.0       | 2.1                             | 0.9  | 26.4   | 0.2                   | 5.7                            | 14.3                             | 1.1                         |
| Optical, surgical, photographic, and other instruments..... | 384-87            | 103                                | 2.0                                  | 2.3                                   | 2.7                                    | 1.1       | 1.1                             | 0.3  | 27.5   | 8.6                   | 3.7                            | 3.4                              | 0.9                         |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39          | 193                                | 9.3                                  | 6.9                                   | 12.3                                   | 14.0      | 13.7                            | 0.0  | 63.8   | 79.5                  | 24.8                           | 20.9                             | 17.9                        |

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See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error for selected estimates, by industry and size of company: 1997

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| Industry and size of company  | SIC code                            | Number of R&D-performing companies | Domestic net sales of R&D performers | Domestic employment of R&D performers | Number of FTE scientists and engineers | Total R&D | Company and other funds for R&D | Company-financed R&D performed outside of U.S. | Company-financed R&D contracted to outside organizations | Federal funds for R&D | Total funds for basic research | Total funds for applied research | Total funds for development |
|---|-------------------------------------|------------------------------------|--------------------------------------|---------------------------------------|--|-----------|---------------------------------|--|--|-----------------------|--------------------------------|----------------------------------|-----------------------------|
|   |                                     |                                    | [Percent]                            |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Distribution by industry:   |                                     |                                    |                                      |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Nonmanufacturing .....  |                                     | 1,617                              | 10.1                                 | 20.7                                  | 4.2                                    | 3.6       | 4.1                             | 3.0  | 12.7   | 4.0                   | 16.0                           | 8.8                              | 3.6                         |
| Transportation and utilities.....   | 40-42,44-49                         | 106                                | 22.1                                 | 43.8                                  | 29.7                                   | 14.9      | 16.0                            | 0.0  | 14.9   | 0.0                   | 0.9                            | 29.2                             | 10.6                        |
| Communications.....   | 48                                  | 26                                 | 24.8                                 | 27.2                                  | 1.2                                    | 0.3       | 0.3                             | 0.0  | 1.4  | 0.0                   | 0.7                            | 0.0                              | 0.4                         |
| Telephone communications.....   | 481                                 | 10                                 | 25.5                                 | 28.8                                  | 0.6                                    | 0.0       | 0.0                             | 0.0  | 1.4  | 0.0                   | 0.0                            | 0.0                              | 0.0                         |
| Other communications.....   | 482-484,489                         | 16                                 | 1.4                                  | 0.8                                   | 14.9                                   | 9.9       | 9.9                             | 0.0  | 0.0  | 0.0                   | 6.7                            | 0.0                              | 18.7                        |
| Electric, gas, and sanitary services.....                                       | 49                                  | 61                                 | 9.6                                  | 6.3                                   | 7.9                                    | 3.3       | 3.6                             | 0.0  | 8.3  | 0.0                   | 7.8                            | 1.0                              | 5.3                         |
| Other transportation and utilities.....   | 40-42,44-47                         | 19                                 | 65.7                                 | 73.1                                  | 79.8                                   | 65.6      | 66.9                            | 0.0  | 89.3   | 0.0                   | 15.0                           | 94.1                             | 84.0                        |
| Trade.....  | 50-59                               | 192                                | 9.7                                  | 15.5                                  | 11.4                                   | 12.9      | 13.0                            | 6.0  | 63.0   | 2.0                   | 46.9                           | 28.5                             | 12.4                        |
| Finance, insurance, and real estate.....  | 60-65,67                            | 50                                 | 3.9                                  | 6.2                                   | 28.3                                   | 20.0      | 20.0                            | 0.0  | 17.2   | 0.0                   | 26.4                           | 38.1                             | 20.4                        |
| Services.....   | 701,72,73,<br>75-81,83,84,<br>87,89 | 1,177                              | 3.5                                  | 5.0                                   | 3.1                                    | 2.3       | 2.6                             | 2.6  | 4.0  | 4.0                   | 9.4                            | 4.7                              | 2.9                         |
| Business services.....  | 73                                  | 463                                | 2.7                                  | 3.0                                   | 4.3                                    | 3.4       | 3.4                             | 3.0  | 8.1  | 27.5                  | 23.8                           | 8.5                              | 3.4                         |
| Computer and data processing services.....                                      | 737                                 | 423                                | 2.9                                  | 3.2                                   | 4.3                                    | 3.5       | 3.5                             | 3.0  | 8.2  | 28.3                  | 24.1                           | 8.7                              | 3.5                         |
| Other business services.....  | 731-736,738                         | 40                                 | 6.5                                  | 4.4                                   | 14.7                                   | 4.7       | 4.9                             | 0.0  | 57.1   | 0.0                   | 48.1                           | 10.8                             | 5.3                         |
| Health services.....  | 80                                  | 33                                 | 10.1                                 | 14.7                                  | 8.7                                    | 2.7       | 2.5                             | 0.0  | 0.0  | 67.9                  | 35.1                           | 4.7                              | 0.3                         |
| Offices and clinics of medical doctors, hospitals, medical and dental labs..... | 801,806,807                         | 26                                 | 10.8                                 | 16.3                                  | 8.2                                    | 2.4       | 2.1                             | 0.0  | 0.0  | 89.7                  | 41.1                           | 5.2                              | 0.3                         |
| Other health services.....  | 802-805,<br>808-809                 | 7                                  | 18.6                                 | 19.5                                  | 35.9                                   | 20.3      | 20.8                            | 0.0  | 0.0  | 0.0                   | 0.0                            | 0.0                              | 0.0                         |

See explanatory information and SOURCE at end of table.

**Table B-2. Relative standard error for selected estimates, by industry and size of company: 1997**

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| Industry and size of company                         | SIC code                     | Number of R&D-performing companies | Domestic net sales of R&D performers | Domestic employment of R&D performers | Number of FTE scientists and engineers | Total R&D | Company and other funds for R&D | Company-financed R&D performed outside of U.S. | Company-financed R&D contracted to outside organizations | Federal funds for R&D | Total funds for basic research | Total funds for applied research | Total funds for development |
|--|------------------------------|------------------------------------|--------------------------------------|---------------------------------------|--|-----------|---------------------------------|--|--|-----------------------|--------------------------------|----------------------------------|-----------------------------|
|  |                              |                                    | [Percent]                            |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Distribution by industry:                            |                              |                                    |                                      |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Engineering and management services.....             | 87                           | 654                                | 1.6                                  | 2.1                                   | 3.4                                    | 2.6       | 3.6                             | 4.5  | 6.4  | 3.2                   | 6.0                            | 6.2                              | 3.4                         |
| Engineering, architectural, and surveying.....       | 871                          | 265                                | 1.5                                  | 2.1                                   | 5.0                                    | 6.3       | 10.7                            | 0.0  | 5.5  | 7.2                   | 17.2                           | 8.9                              | 7.5                         |
| Research, development, and testing.....              | 873                          | 362                                | 2.1                                  | 2.4                                   | 3.8                                    | 2.1       | 2.7                             | 4.2  | 6.5  | 2.7                   | 5.9                            | 3.9                              | 3.6                         |
| Other engineering and management services...         | 872,874                      | 27                                 | 5.5                                  | 7.0                                   | 20.3                                   | 40.2      | 42.0                            | 71.7   | 0.0  | 0.0                   | 6.9                            | 75.3                             | 21.9                        |
| Other services.....                                  | 701,72,75-79,<br>81,83,84,89 | 27                                 | 16.0                                 | 32.3                                  | 47.6                                   | 46.0      | 46.7                            | 0.0  | 0.0  | 29.3                  | 16.5                           | 0.0                              | 49.3                        |
| Other nonmanufacturing industries <sup>1</sup> ..... | 07-12,14,15,<br>161-162,17   | 92                                 | 4.8                                  | 7.0                                   | 25.2                                   | 22.3      | 23.0                            | 60.9   | 59.5   | 69.4                  | 35.9                           | 26.6                             | 26.7                        |

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error for selected estimates, by industry and size of company: 1997

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| Industry and size of company                              | SIC code | Number of R&D-performing companies | Domestic net sales of R&D performers | Domestic employment of R&D performers | Number of FTE scientists and engineers | Total R&D | Company and other funds for R&D | Company-financed R&D performed outside of U.S. | Company-financed R&D contracted to outside organizations | Federal funds for R&D | Total funds for basic research | Total funds for applied research | Total funds for development |
|---|----------|------------------------------------|--------------------------------------|---------------------------------------|--|-----------|---------------------------------|--|--|-----------------------|--------------------------------|----------------------------------|-----------------------------|
|   |          |                                    | [Percent]                            |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Distribution by size of company:<br>[Number of employees] |          |                                    |                                      |                                       |  |           |                                 |  |  |                       |                                |                                  |                             |
| Total.....  |          | 3,741                              | 3.6                                  | 8.8                                   | 1.4                                    | 1.0       | 1.2                             | 0.4  | 4.3  | 1.0                   | 5.5                            | 3.2                              | 1.1                         |
| Fewer than 500.....                                       |          | 1,851                              | 8.4                                  | 4.9                                   | 5.9                                    | 5.6       | 6.1                             | 10.7   | 13.3   | 10.4                  | 12.5                           | 12.6                             | 6.9                         |
| 500 to 999.....   |          | 474                                | 14.3                                 | 10.6                                  | 6.4                                    | 3.3       | 3.6                             | 15.8   | 2.2  | 2.4                   | 4.7                            | 3.4                              | 5.2                         |
| 1,000 to 4,999.....                                       |          | 881                                | 7.8                                  | 5.6                                   | 2.1                                    | 3.0       | 3.1                             | 1.1  | 22.8   | 1.0                   | 20.8                           | 1.6                              | 1.9                         |
| 5,000 to 9,999.....                                       |          | 248                                | 12.8                                 | 13.8                                  | 3.0                                    | 2.7       | 2.8                             | 0.0  | 1.5  | 3.7                   | 0.1                            | 3.9                              | 3.1                         |
| 10,000 to 24,999.....                                     |          | 172                                | 1.7                                  | 7.8                                   | 0.3                                    | 0.3       | 0.3                             | 0.6  | 0.0  | 0.0                   | 0.0                            | 0.5                              | 0.4                         |
| 25,000 or more.....                                       |          | 115                                | 6.8                                  | 18.8                                  | 1.3                                    | 0.6       | 0.8                             | 0.0  | 2.9  | 0.0                   | 0.0                            | 3.7                              | 0.4                         |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**NOTE:** A description of the standard error of estimate is given in section A under "Survey Methodology." The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentages shown by the associated estimates. For example, the relative standard error of estimate for R&D performance for all company size groups in the stone, clay, and glass products industry (SIC 32) is shown as 0.8 percent, and the associated total R&D estimate for this industry is shown as \$608 million in Table A-3, "Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1987-97." The standard error of estimate, then, is 0.008 times 608 or 4.9.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

companies received a sample weight that was the inverse of their probability of selection. Selected companies that ultimately report R&D expenditures vastly larger than their assigned values can have adverse effects on the statistics, which are based on the weighted value of survey responses. To lessen the effects on the final statistics, the maximum weight of a company was controlled by specifying a minimum probability that could be assigned to the company. If the probability based on company size was less than the minimum probability, it was reset to this minimum value. The consequence of raising these original probabilities to the minimum probability was to raise the expected sample size. Similarly, a maximum weight for each stratum was established for the SRS of the small partition. If the sample size initially allocated to a stratum resulted in a stratum weight above this maximum value, then the sample size was increased until the maximum weight was achieved. It is likely that most of the difference between the size of the target sample and the sample actually selected was due to the minimum probability rule.

**Changes in Operational Status.** Third, between the time the frame was created and the survey was prepared for mailing, the operational status of some companies changed. That is, they were merged with or acquired by another company, or they were no longer in business. Before preparing the survey for mailing, the operational status was updated to identify these changes. As a result, the number of companies mailed a survey form was somewhat smaller than the number of companies initially selected for the survey.

## WEIGHTING AND MAXIMUM WEIGHTS

Weights were applied to each company record to produce national estimates. Within the PPS partitions of the sample, company records were given weights up to a maximum of 50; for companies within the SRS partitions, company records were given weights up to a maximum of 250.

## SURVEY QUESTIONNAIRES

Two questionnaires are used each year to collect data for the survey: Form RD-1 in two versions for large firms, and Form RD-1A for small firms and first-time reporters. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years; an abbreviated version, Form RD-1S,

is used to collect data for even-numbered years. The questionnaires are cycled in this manner to reduce the reporting burden on survey respondents.

## QUESTIONNAIRE CONTENT

Form RD-1L, which was used for the 1997 survey, requests data on sales or receipts; total employment; employment of scientists and engineers; expenditures for R&D performed within the company with Federal funds and with company and other funds; character of work (basic research, applied research, and development); company-sponsored R&D expenditures in foreign countries; R&D performed under contract by others; expenditures for pollution abatement and energy R&D; detail on R&D by product field; Federal R&D support to the firm by contracting agency; domestic R&D expenditures by state; and foreign R&D by country. Form RD-1S requests the same information except the last four items. Because companies receiving Forms RD-1L and RD-1S generally have participated in previous surveys, computerized imprinted data reported by the company for the previous year are supplied for reference.

To further limit reporting burden on small R&D performers and firms that are included in the sample for the first time, an even more abbreviated form is used each year. Form RD-1A collects data only on R&D, sales, employment, and operational status and includes a screening item that allows respondents to indicate that they do not perform R&D before completing the questionnaire. No prior year information is available since the majority of the companies have not reported previously.

**New Items.** Beginning in 1996, the collection of data on R&D performed under contract by others was expanded. Previously, data were collected only on nonfederally funded R&D performed under contract by others. In 1996, data on contracted-out federally funded and total R&D were collected to better measure the amount of R&D performed both within and between companies.

## NUMBER OF QUESTIONNAIRES SENT

For the 1997 survey, approximately 2,900 companies, including those that reported \$5 million or more in R&D expenditures in the 1996 survey, received Form RD-1L; and approximately 20,500 received Form RD-1A. Of the 23,400 firms, about 3,700 reported R&D expenditures for 1997. All three questionnaire forms and their accompanying instructions are reproduced in section C.

## FOLLOW-UP FOR SURVEY NONRESPONSE

The 1997 survey questionnaires were mailed in March 1998, and recipients were asked to respond within 60 days. Thirty days later, letters were mailed to all survey recipients reminding them that their completed questionnaire was due within the next 30 days. After 60 days, follow-up letters were sent to all firms that did not respond. Three additional follow-up mailings were made to persistent nonrespondents after 90, 120, and 150 days.

In addition to the mailings, telephone follow-up was used to encourage response from those firms ranked among the 300 largest R&D performers, based on total R&D expenditures reported in the previous survey. Table B-3 shows the number of companies in each industry or industry group that received a questionnaire and the percentage of companies that responded to the survey.

## IMPUTATION FOR ITEM NONRESPONSE

For various reasons, many firms chose to return the survey questionnaires with one or more blank items.<sup>5</sup> For instance, the internal accounting procedures of the firm may not have allowed it to quantify the character of work distribution of R&D. In addition, some firms refused as a matter of policy to answer any voluntary questions.<sup>6</sup>

When respondents did not provide the requested information, estimates for the missing data were made using imputation algorithms. In general, the imputation algorithms computed values for missing items by applying the average percentage change for the target item in the nonresponding firm's industry to the item's prior year value for that firm, reported or imputed. This approach, with minor variation, was used for most items.<sup>7</sup> Table B-4 contains imputation rates for the principal survey items.

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<sup>5</sup> For detailed discussions on the sources, control, and measurement of error resulting from item nonresponse, see U.S. Bureau of the Census (1994b). For a general discussion of the problems stemming from item nonresponse, see NSF (1990).

<sup>6</sup> All but four items—total R&D, Federal R&D, net sales, and total employment, which are included in the Census Bureau's annual mandatory statistical program—are voluntary. See further discussion under "Response Rates and Mandatory Versus Voluntary Reporting" later.

<sup>7</sup> For detailed descriptions and analyses of the imputation methods and algorithms used, see U.S. Bureau of the Census (1994c).

## RESPONSE RATES AND MANDATORY VERSUS VOLUNTARY REPORTING

Current survey reporting requirements divide survey items into two groups: mandatory and voluntary. Response to four data items on the questionnaires is mandatory; response to the remaining items is voluntary. During the 1990 survey cycle, NSF conducted a test of the effect of reporting on a completely voluntary basis to determine if combining both mandatory and voluntary items on one questionnaire influences response rates. For this test, the 1990 sample was divided into two panels of approximately equal size. One panel—the mandatory panel—was asked to report as usual on four mandatory items with the remainder voluntary; the other panel was asked to report all items on a completely voluntary basis. The result of the test was a decrease in the overall survey response rate to 80 percent from levels of 88 percent in 1989 and 89 percent in 1988. The response rates for the mandatory and voluntary panels were 89 and 69 percent, respectively. Detailed results of the test were published in the annual report resulting from the 1990 survey.<sup>8</sup> For firms that reported R&D expenditures in 1997, table B-5 shows the percentage that also reported data for other selected items.

## CHARACTER OF WORK ESTIMATES

Response to questions about character of work (basic research, applied research, and development) declined in the mid-1980s, and, as a result, imputation rates increased. The general imputation procedure described above became increasingly dependent upon information imputed in prior years, thereby distancing current-year estimates from any reported information. Because of the increasing dependence on imputed data, NSF chose not to publish character of work estimates in 1986. The imputation procedure used to develop these estimates was revised in 1987 for use with later data and differs from the general imputation approach. The new method calculated the character of work distribution for a non-responding firm only if that firm reported a distribution within a 5-year period, extending from 2 years before to 2 years after the year requiring imputation. Imputation for a given year was initially performed in the year the

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<sup>8</sup> NSF, *Research and Development in Industry: 1990* (NSF 94-304), John R. Gawalt (Washington, DC, 1994).

**Table B-3. Unit response rates percentage of companies that responded to survey, by industry: 1997**

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| Industry  | SIC code       | Number of companies that received questionnaire | Response rate |
|---|----------------|---|---------------|
| All Industries.....   |                | 23,377  | 84.7%         |
| Manufacturing.....  |                | 4,651   | 83.7          |
| Food, kindred, and tobacco products .....                   | 20,21          | 158   | 90.5          |
| Textiles and apparel.....                                   | 22,23          | 188   | 84.6          |
| Lumber, wood products, and furniture.....                   | 24,25          | 170   | 88.2          |
| Paper and allied products.....                              | 26             | 96  | 88.5          |
| Chemicals and allied products.....                          | 28             | 247   | 83.4          |
| Industrial chemicals.....                                   | 281-82,286     | 72  | 88.9          |
| Drugs and medicines.....                                    | 283            | 53  | 86.8          |
| Other chemicals.....  | 284-85,287-89  | 122   | 78.7          |
| Petroleum refining and extraction.....                      | 13,29          | 56  | 87.5          |
| Rubber products.....  | 30             | 281   | 81.8          |
| Stone, clay, and glass products.....                        | 32             | 64  | 87.5          |
| Primary metals.....   | 33             | 98  | 87.8          |
| Ferrous metals and products.....                            | 331-32,3398-99 | 41  | 92.7          |
| Nonferrous metals and products.....                         | 333-36         | 57  | 84.2          |
| Fabricated metal products.....                              | 34             | 406   | 83.7          |
| Machinery.....  | 35             | 335   | 84.8          |
| Office, computing, and accounting machines.....             | 357            | 62  | 80.6          |
| Other machinery, except electrical.....                     | 351-56,358-59  | 273   | 85.7          |
| Electrical equipment.....                                   | 36             | 360   | 80.0          |
| Radio and TV receiving equipment.....                       | 365            | 20  | 70.0          |
| Communication equipment.....                                | 366            | 83  | 77.1          |
| Electronic components.....                                  | 367            | 133   | 84.2          |
| Other electrical equipment.....                             | 361-64,369     | 124   | 79.0          |
| Transportation equipment.....                               | 37             | 83  | 86.7          |
| Motor vehicles and motor vehicles equipment.....            | 371            | 41  | 92.7          |
| Other transportation equipment.....                         | 373-75,379     | 14  | 71.4          |
| Aircraft and missiles.....                                  | 372,376        | 28  | 85.7          |
| Professional and scientific instruments.....                | 38             | 340   | 80.6          |
| Scientific and mechanical measuring instruments.....        | 381-82         | 202   | 83.7          |
| Optical, surgical, photographic, and other instruments..... | 384-87         | 138   | 76.1          |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39       | 1,761   | 83.2          |

See explanatory information and SOURCE at end of table.

**Table B-3. Unit response rates percentage of companies that responded to survey, by industry: 1997**

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| Industry   | SIC code                        | Number of companies that received questionnaire | Response rate |
|--|---------------------------------|---|---------------|
| Nonmanufacturing .....   |                                 | 18,726  | 84.9%         |
| Transportation and utilities.....  | 40-42,44-49                     | 898   | 85.6          |
| Communications.....  | 48                              | 322   | 84.1          |
| Telephone communications.....  | 481                             | 33  | 90.9          |
| Other communications.....  | 482-484,489                     | 289   | 83.4          |
| Electric, gas, and sanitary services.....  | 49                              | 121   | 87.6          |
| Other transportation and utilities.....  | 40-42,44-47                     | 455   | 86.1          |
| Trade.....   | 50-59                           | 4,733   | 84.8          |
| Finance, insurance, and real estate.....   | 60-65,67                        | 835   | 86.8          |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 6,011   | 84.8          |
| Business services.....   | 73                              | 1,505   | 80.5          |
| Computer and data processing services.....   | 737                             | 760   | 77.4          |
| Other business services.....   | 731-736,738                     | 745   | 83.8          |
| Health services.....   | 80                              | 826   | 87.0          |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | 473   | 88.4          |
| Other health services.....   | 802-805,808-809                 | 353   | 85.3          |
| Engineering and management services.....   | 87                              | 2,435   | 87.3          |
| Engineering, architectural, and surveying.....                                     | 871                             | 1,235   | 89.6          |
| Research, development, and testing.....  | 873                             | 717   | 82.7          |
| Other engineering and management<br>services.....                                  | 872,874                         | 483   | 88.0          |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | 1,245   | 83.4          |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | 6,249   | 84.8          |

See explanatory information and SOURCE at end of table.

**Table B-3. Unit response rates percentage of companies that responded to survey, by industry: 1997**

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| Industry  | SIC code       | Number of companies that received questionnaire | Response rate |
|---|----------------|---|---------------|
| All companies receiving Form RD-1L                          |                |   |               |
| All Industries.....   |                | 2,537   | 84.6%         |
| Manufacturing.....  |                | 1,480   | 85.6          |
| Food, kindred, and tobacco products .....                   | 20,21          | 71  | 85.9          |
| Textiles and apparel.....                                   | 22,23          | 49  | 89.8          |
| Lumber, wood products, and furniture.....                   | 24,25          | 31  | 87.1          |
| Paper and allied products.....                              | 26             | 44  | 90.9          |
| Chemicals and allied products.....                          | 28             | 165   | 87.3          |
| Industrial chemicals.....                                   | 281-82,286     | 60  | 91.7          |
| Drugs and medicines.....                                    | 283            | 49  | 85.7          |
| Other chemicals.....  | 284-85,287-89  | 56  | 83.9          |
| Petroleum refining and extraction.....                      | 13,29          | 20  | 90.0          |
| Rubber products.....  | 30             | 105   | 84.8          |
| Stone, clay, and glass products.....                        | 32             | 34  | 88.2          |
| Primary metals.....   | 33             | 59  | 86.4          |
| Ferrous metals and products.....                            | 331-32,3398-99 | 25  | 88.0          |
| Nonferrous metals and products.....                         | 333-36         | 34  | 85.3          |
| Fabricated metal products.....                              | 34             | 112   | 85.7          |
| Machinery.....  | 35             | 229   | 86.9          |
| Office, computing, and accounting machines.....             | 357            | 54  | 83.3          |
| Other machinery, except electrical.....                     | 351-56,358-59  | 175   | 88.0          |
| Electrical equipment.....                                   | 36             | 254   | 80.7          |
| Radio and TV receiving equipment.....                       | 365            | 16  | 75.0          |
| Communication equipment.....                                | 366            | 72  | 76.4          |
| Electronic components.....                                  | 367            | 93  | 83.9          |
| Other electrical equipment.....                             | 361-64,369     | 73  | 82.2          |
| Transportation equipment.....                               | 37             | 63  | 88.9          |
| Motor vehicles and motor vehicles equipment....             | 371            | 29  | 93.1          |
| Other transportation equipment.....                         | 373-75,379     | 9   | 88.9          |
| Aircraft and missiles.....                                  | 372,376        | 25  | 84.0          |
| Professional and scientific instruments.....                | 38             | 178   | 85.4          |
| Scientific and mechanical measuring instruments.....        | 381-82         | 98  | 86.7          |
| Optical, surgical, photographic, and other instruments..... | 384-87         | 80  | 83.7          |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39       | 66  | 83.3          |

See explanatory information and SOURCE at end of table.

**Table B-3. Unit response rates percentage of companies that responded to survey, by industry: 1997**

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| Industry   | SIC code                        | Number of companies that received questionnaire | Response rate |
|--|---------------------------------|---|---------------|
| Nonmanufacturing .....   |                                 | 1,057   | 83.2%         |
| Transportation and utilities.....  | 40-42,44-49                     | 70  | 84.3          |
| Communications.....  | 48                              | 17  | 100.0         |
| Telephone communications.....  | 481                             | 10  | 100.0         |
| Other communications.....  | 482-484,489                     | 7   | 100.0         |
| Electric, gas, and sanitary services.....  | 49                              | 40  | 80.0          |
| Other transportation and utilities.....  | 40-42,44-47                     | 13  | 76.9          |
| Trade.....   | 50-59                           | 113   | 82.3          |
| Finance, insurance, and real estate.....   | 60-65,67                        | 43  | 74.4          |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 804   | 83.3          |
| Business services.....   | 73                              | 351   | 81.5          |
| Computer and data processing services.....   | 737                             | 328   | 81.1          |
| Other business services.....   | 731-736,738                     | 23  | 87.0          |
| Health services.....   | 80                              | 20  | 90.0          |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | 14  | 92.9          |
| Other health services.....   | 802-805,808-809                 | 6   | 83.3          |
| Engineering and management services.....   | 87                              | 418   | 84.4          |
| Engineering, architectural, and surveying.....                                     | 871                             | 142   | 82.4          |
| Research, development, and testing.....  | 873                             | 263   | 85.9          |
| Other engineering and management<br>services.....                                  | 872,874                         | 13  | 76.9          |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | 15  | 86.7          |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | 27  | 92.6          |

See explanatory information and SOURCE at end of table.

**Table B-3. Unit response rates percentage of companies that responded to survey, by industry: 1997**

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| Industry  | SIC code       | Number of companies that received questionnaire | Response rate |
|---|----------------|---|---------------|
| All companies receiving Form RD-1A                          |                |   |               |
| All Industries.....   |                | 20,840  | 84.7%         |
| Manufacturing.....  |                | 3,171   | 82.8          |
| Food, kindred, and tobacco products .....                   | 20,21          | 87  | 94.2          |
| Textiles and apparel.....                                   | 22,23          | 139   | 82.7          |
| Lumber, wood products, and furniture.....                   | 24,25          | 139   | 88.5          |
| Paper and allied products.....                              | 26             | 52  | 86.5          |
| Chemicals and allied products.....                          | 28             | 82  | 75.6          |
| Industrial chemicals.....                                   | 281-82,286     | 12  | 75.0          |
| Drugs and medicines.....                                    | 283            | 4   | 100.0         |
| Other chemicals.....  | 284-85,287-89  | 66  | 74.2          |
| Petroleum refining and extraction.....                      | 13,29          | 36  | 86.1          |
| Rubber products.....  | 30             | 176   | 80.1          |
| Stone, clay, and glass products.....                        | 32             | 30  | 86.7          |
| Primary metals.....   | 33             | 39  | 89.7          |
| Ferrous metals and products.....                            | 331-32,3398-99 | 16  | 100.0         |
| Nonferrous metals and products.....                         | 333-36         | 23  | 82.6          |
| Fabricated metal products.....                              | 34             | 294   | 83.0          |
| Machinery.....  | 35             | 106   | 80.2          |
| Office, computing, and accounting machines.....             | 357            | 8   | 62.5          |
| Other machinery, except electrical.....                     | 351-56,358-59  | 98  | 81.6          |
| Electrical equipment.....                                   | 36             | 106   | 78.3          |
| Radio and TV receiving equipment.....                       | 365            | 4   | 50.0          |
| Communication equipment.....                                | 366            | 11  | 81.8          |
| Electronic components.....                                  | 367            | 40  | 85.0          |
| Other electrical equipment.....                             | 361-64,369     | 51  | 74.5          |
| Transportation equipment.....                               | 37             | 20  | 80.0          |
| Motor vehicles and motor vehicles equipment.....            | 371            | 12  | 91.7          |
| Other transportation equipment.....                         | 373-75,379     | 5   | 40.0          |
| Aircraft and missiles.....                                  | 372,376        | 3   | 100.0         |
| Professional and scientific instruments.....                | 38             | 162   | 75.3          |
| Scientific and mechanical measuring instruments.....        | 381-82         | 104   | 80.8          |
| Optical, surgical, photographic, and other instruments..... | 384-87         | 58  | 65.5          |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39       | 1,695   | 83.2          |

See explanatory information and SOURCE at end of table.

**Table B-3. Unit response rates percentage of companies that responded to survey, by industry: 1997**

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| Industry   | SIC code                        | Number of companies that received questionnaire | Response rate |
|--|---------------------------------|---|---------------|
| Nonmanufacturing .....   |                                 | 17,669  | 85.0%         |
| Transportation and utilities.....  | 40-42,44-49                     | 828   | 85.7          |
| Communications.....  | 48                              | 305   | 83.2          |
| Telephone communications.....  | 481                             | 23  | 87.0          |
| Other communications.....  | 482-484,489                     | 282   | 83.0          |
| Electric, gas, and sanitary services.....  | 49                              | 81  | 91.4          |
| Other transportation and utilities.....  | 40-42,44-47                     | 442   | 86.4          |
| Trade.....   | 50-59                           | 4,620   | 84.9          |
| Finance, insurance, and real estate.....   | 60-65,67                        | 792   | 87.5          |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 5,207   | 85.0          |
| Business services.....   | 73                              | 1,154   | 80.2          |
| Computer and data processing services.....   | 737                             | 432   | 74.5          |
| Other business services.....   | 731-736,738                     | 722   | 83.7          |
| Health services.....   | 80                              | 806   | 87.0          |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | 459   | 88.2          |
| Other health services.....   | 802-805,808-809                 | 347   | 85.3          |
| Engineering and management services.....   | 87                              | 2,017   | 87.8          |
| Engineering, architectural, and surveying.....                                     | 871                             | 1,093   | 90.6          |
| Research, development, and testing.....  | 873                             | 454   | 80.8          |
| Other engineering and management<br>services.....                                  | 872,874                         | 470   | 88.3          |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | 1,230   | 83.4          |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | 6,222   | 84.7          |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

**NOTES:** The calculation of the response rate was based on all companies that responded to the survey, including those that reported they were out of scope, out of business, or had merged with another company. It excludes companies for which total R&D expenditure data were imputed.

The total number of companies is generally less than the number of companies sampled in Table B-1 because some companies selected for the survey went out of business or were merged with other companies during the time between survey sampling and survey mailout.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

Table B-4. Imputation rates for selected items, by industry: 1997

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| Industry  | SIC code           | Net Sales | Total employment | R&D scientists/engineers | Total R&D |         |         | R&D by cost |           |             | R&D by State | Energy R&D | Pollution abatement | R&D outside company | Foreign R&D |
|---|--------------------|-----------|------------------|--------------------------|-----------|---------|---------|-------------|-----------|-------------|--------------|------------|---------------------|---------------------|-------------|
|   |                    |           |                  |                          | Total     | Company | Federal | Wages       | Materials | Other costs |              |            |                     |                     |             |
| [Percent]                                       |                    |           |                  |                          |           |         |         |             |           |             |              |            |                     |                     |             |
| All Industries.....                             |                    | 9.5       | 9.0              | 36.8                     | 8.5       | 9.1     | 27.8    | 63.9        | 68.5      | 68.7        | 58.1         | 13.4       | 38.1                | 5.1                 | 5.6         |
| Manufacturing.....                              |                    | 11.1      | 9.5              | 41.8                     | 7.5       | 9.3     | 23.6    | 67.4        | 69.4      | 71.4        | 59.3         | 16.0       | 38.1                | 2.8                 | 5.4         |
| Food, kindred, and tobacco products .....       | 20,21              | 6.9       | 15.8             | 43.1                     | 6.1       | 7.1     | 0.0     | 49.9        | 52.7      | 41.4        | 50.1         | 0.0        | 0.0                 | 0.5                 | 0.1         |
| Textiles and apparel.....                       | 22,23              | 7.0       | 14.2             | 30.7                     | 12.1      | 12.1    | 0.0     | 65.4        | 71.0      | 67.2        | 64.4         | 0.0        | 0.0                 | 0.0                 | 0.0         |
| Lumber, wood products, and furniture.....       | 24,25              | 6.9       | 4.9              | 20.4                     | 2.6       | 7.5     | 0.0     | 54.3        | 43.2      | 56.5        | 57.9         | 0.0        | 0.0                 | 10.4                | 0.0         |
| Paper and allied products.....                  | 26                 | 17.3      | 19.8             | 81.4                     | 48.1      | 47.4    | 99.6    | 84.5        | 84.4      | 84.5        | 84.9         | 0.0        | 0.0                 | 74.2                | 0.0         |
| Chemicals and allied products.....              | 28                 | 5.5       | 6.9              | 28.0                     | 4.9       | 4.0     | 58.0    | 66.4        | 62.8      | 62.4        | 53.5         | 2.8        | 25.7                | 2.0                 | 1.5         |
| Industrial chemicals.....                       | 281-82,286         | 6.0       | 10.0             | 30.2                     | 10.9      | 7.9     | 60.8    | 81.7        | 81.6      | 77.3        | 74.4         | 3.2        | 33.7                | 2.3                 | 4.9         |
| Drugs and medicines.....                        | 283                | 3.9       | 2.8              | 18.4                     | 1.5       | 1.4     | 62.3    | 59.6        | 55.2      | 60.4        | 45.3         | 0.0        | 0.0                 | 2.1                 | 0.5         |
| Other chemicals.....                            | 284-85,287-89      | 6.7       | 7.1              | 49.7                     | 8.6       | 9.2     | 0.0     | 54.3        | 47.2      | 42.0        | 44.0         | 0.0        | 0.0                 | 0.8                 | 1.0         |
| Petroleum refining and extraction.....          | 13,29              | 4.7       | 8.3              | 26.9                     | 10.2      | 9.8     | 0.0     | 42.4        | 51.3      | 42.7        | 51.5         | 14.0       | 16.9                | 0.0                 | 0.0         |
| Rubber products.....                            | 30                 | 5.6       | 11.2             | 23.2                     | 16.5      | 22.6    | 18.5    | 49.8        | 59.2      | 64.3        | 68.4         | 0.0        | 0.0                 | 4.7                 | 20.3        |
| Stone, clay, and glass products.....            | 32                 | 10.7      | 12.9             | 51.4                     | 8.5       | 8.4     | 0.0     | 44.9        | 45.4      | 46.4        | 50.1         | 0.0        | 0.0                 | 0.0                 | 0.0         |
| Primary metals.....                             | 33                 | 3.0       | 12.3             | 64.5                     | 3.1       | 4.0     | 0.1     | 72.6        | 73.7      | 76.6        | 41.3         | 0.0        | 16.6                | 0.5                 | 0.0         |
| Ferrous metals and products.....                | 331-32,<br>3398-99 | 2.2       | 14.4             | 75.1                     | 2.3       | 3.5     | 0.0     | 71.7        | 70.4      | 72.1        | 12.7         | 0.0        | 17.4                | 0.0                 | 0.0         |
| Nonferrous metals and products.....             | 333-36             | 4.0       | 8.9              | 47.3                     | 4.5       | 4.6     | 2.0     | 73.8        | 75.5      | 86.0        | 77.7         | 0.0        | 0.0                 | 0.9                 | 0.0         |
| Fabricated metal products.....                  | 34                 | 10.9      | 9.6              | 28.2                     | 3.7       | 7.0     | 9.9     | 58.3        | 58.6      | 57.7        | 51.6         | 0.0        | 24.6                | 3.3                 | 1.3         |
| Machinery.....                                  | 35                 | 10.5      | 8.0              | 22.5                     | 8.9       | 24.8    | 10.0    | 50.1        | 50.7      | 49.3        | 42.3         | 32.0       | 48.2                | 4.2                 | 11.9        |
| Office, computing, and accounting machines..... | 357                | 15.2      | 11.1             | 13.6                     | 10.1      | 32.4    | 0.0     | 50.9        | 51.6      | 51.1        | 46.0         | 0.0        | 0.0                 | 3.0                 | 15.9        |
| Other machinery, except electrical.....         | 351-56,358-59      | 7.0       | 6.6              | 35.3                     | 6.2       | 7.6     | 19.9    | 47.6        | 49.3      | 43.4        | 33.1         | 32.0       | 48.2                | 5.5                 | 4.2         |

See explanatory information and SOURCE at end of table.

Table B-4. Imputation rates for selected items, by industry: 1997

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| Industry  | SIC code    | Net Sales | Total employment | R&D scientists/engineers | Total R&D |         |         | R&D by cost |           |             | R&D by State | Energy R&D | Pollution abatement | R&D outside company | Foreign R&D |
|---|-------------|-----------|------------------|--------------------------|-----------|---------|---------|-------------|-----------|-------------|--------------|------------|---------------------|---------------------|-------------|
|   |             |           |                  |                          | Total     | Company | Federal | Wages       | Materials | Other costs |              |            |                     |                     |             |
| [Percent]   |             |           |                  |                          |           |         |         |             |           |             |              |            |                     |                     |             |
| Electrical equipment.....                                   | 36          | 7.9       | 9.4              | 46.5                     | 3.6       | 4.8     | 2.5     | 60.3        | 61.2      | 66.5        | 52.4         | 0.0        | 0.0                 | 0.1                 | 6.6         |
| Radio and TV receiving equipment.....                       | 365         | 10.6      | 15.8             | 23.2                     | 41.1      | 41.1    | 41.7    | 47.3        | 49.8      | 48.6        | 44.9         | 0.0        | 0.0                 | 6.8                 | 0.0         |
| Communication equipment.....                                | 366         | 7.1       | 6.1              | 42.9                     | 3.0       | 6.1     | 2.1     | 44.6        | 46.2      | 54.1        | 35.5         | 0.0        | 0.0                 | 0.0                 | 14.0        |
| Electronic components.....                                  | 367         | 6.7       | 6.0              | 65.0                     | 2.2       | 2.3     | 2.9     | 81.7        | 85.4      | 76.5        | 64.8         | 0.0        | 0.0                 | 0.0                 | 1.9         |
| Other electrical equipment.....                             | 361-64,369  | 9.3       | 13.4             | 18.5                     | 6.6       | 7.7     | 2.0     | 30.8        | 53.0      | 56.2        | 50.4         | 0.0        | 0.0                 | 0.0                 | 0.6         |
| Transportation equipment.....                               | 37          | 27.9      | 4.0              | 57.2                     | 5.1       | 3.2     | 17.1    | 84.8        | 81.2      | 91.6        | 75.4         | 0.0        | 1.3                 | 0.9                 | 2.3         |
| Motor vehicles and motor vehicles equipment.....            | 371         | 35.7      | 0.3              | 35.5                     | 0.1       | 0.2     | 0.0     | 84.9        | 74.0      | 97.2        | 85.0         | 0.0        | 0.0                 | 0.0                 | 0.0         |
| Other transportation equipment.....                         | 373-75,379  | 0.3       | 2.3              | 44.9                     | 1.1       | 2.1     | 0.0     | 71.8        | 83.5      | 82.3        | 49.5         | 0.0        | 0.0                 | 0.0                 | 0.0         |
| Aircraft and missiles.....                                  | 372,376     | 11.2      | 9.4              | 75.7                     | 9.9       | 10.4    | 19.8    | 85.1        | 90.1      | 88.1        | 67.5         | 0.0        | 17.8                | 11.5                | 39.4        |
| 200 Professional and scientific instruments.....            | 38          | 10.3      | 11.6             | 60.2                     | 18.2      | 8.5     | 37.6    | 76.9        | 82.8      | 83.6        | 63.2         | 0.0        | 0.0                 | 7.5                 | 0.9         |
| Scientific and mechanical measuring instruments.....        | 381-82      | 13.0      | 11.6             | 67.7                     | 26.0      | 11.7    | 38.2    | 79.5        | 84.2      | 85.4        | 69.8         | 0.0        | 0.0                 | 0.5                 | 3.1         |
| Optical, surgical, photographic, and other instruments..... | 384-87      | 7.7       | 11.4             | 45.8                     | 6.3       | 6.3     | 8.5     | 72.8        | 81.0      | 80.8        | 53.3         | 0.0        | 0.0                 | 10.4                | 0.5         |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39    | 6.9       | 5.1              | 12.3                     | 2.3       | 3.0     | 0.0     | 48.8        | 48.0      | 66.5        | 48.2         | 0.0        | 0.0                 | 3.8                 | 5.1         |
| Nonmanufacturing .....                                      |             | 5.6       | 8.2              | 23.9                     | 11.9      | 8.3     | 47.9    | 50.2        | 62.1      | 57.2        | 53.1         | 5.4        | 0.0                 | 9.0                 | 6.4         |
| Transportation and utilities.....                           | 40-42,44-49 | 4.3       | 4.5              | 35.2                     | 20.7      | 23.6    | 8.7     | 70.2        | 67.2      | 71.5        | 71.3         | 0.0        | 0.0                 | 3.8                 | 0.0         |
| Communications.....   | 48          | 0.0       | 0.0              | 57.8                     | 27.4      | 32.8    | 0.0     | 73.8        | 74.4      | 75.1        | 73.8         | 0.0        | 0.0                 | 1.4                 | 0.0         |
| Telephone communications.....                               | 481         | 0.0       | 0.0              | 60.2                     | 28.2      | 33.8    | 0.0     | 74.8        | 74.6      | 75.7        | 75.2         | 0.0        | 0.0                 | 1.4                 | 0.0         |
| Other communications.....                                   | 482-484,489 | 0.0       | 0.5              | 24.8                     | 0.0       | 0.0     | 0.0     | 29.1        | 50.8      | 50.8        | 11.2         | 0.0        | 0.0                 | 0.0                 | 0.0         |

See explanatory information and SOURCE at end of table.

Table B-4. Imputation rates for selected items, by industry: 1997

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| Industry   | SIC code                            | Net Sales  | Total employment | R&D scientists/engineers | Total R&D  |            |             | R&D by cost  |              |              | R&D by State | Energy R&D | Pollution abatement | R&D outside company | Foreign R&D |
|--|-------------------------------------|------------|------------------|--------------------------|------------|------------|-------------|--------------|--------------|--------------|--------------|------------|---------------------|---------------------|-------------|
|  |                                     |            |                  |                          | Total      | Company    | Federal     | Wages        | Materials    | Other costs  |              |            |                     |                     |             |
| [Percent]  |                                     |            |                  |                          |            |            |             |              |              |              |              |            |                     |                     |             |
| Electric, gas, and sanitary services.....                                  | 49                                  | 13.2       | 30.9             | 15.3                     | 16.2       | 16.1       | 17.6        | 30.7         | 36.1         | 35.2         | 33.5         | 0.0        | 0.0                 | 6.1                 | 0.0         |
| Other transportation and utilities.....                                    | 40-42,44-47                         | 0.7<br>1.8 | 0.2<br>4.8       | 5.8<br>14.2              | 2.5<br>4.4 | 0.7<br>4.4 | 96.3<br>0.0 | 71.0<br>66.6 | 90.0<br>76.0 | 89.8<br>68.4 | 93.4<br>46.1 | 0.0<br>0.0 | 0.0<br>0.0          | 0.7<br>1.2          | 0.0<br>13.4 |
| Trade.....   | 50-59                               | 5.2        | 7.1              | 55.1                     | 3.9        | 3.8        | 100.0       | 10.7         | 64.8         | 65.1         | 53.0         | 0.0        | 0.0                 | 29.0                | 0.0         |
| Finance, insurance, and real estate.....                                   | 60-65,67                            | 0.9        | 3.3              | 28.1                     | 5.3        | 5.1        | 100.0       | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0                 | 70.6                | 0.0         |
| Services.....  | 701,72,<br>73,75-81,<br>83,84,87,89 | 10.1       | 15.2             | 21.8                     | 14.6       | 8.6        | 47.5        | 46.0         | 58.1         | 52.0         | 53.0         | 5.1        | 0.0                 | 10.4                | 3.1         |
| Business services.....   | 73                                  | 8.7        | 16.3             | 19.4                     | 8.5        | 8.7        | 18.4        | 39.7         | 50.9         | 48.1         | 53.5         | 0.0        | 0.0                 | 14.9                | 2.0         |
| Computer and data processing services.....                                 | 737                                 | 10.6       | 17.4             | 19.7                     | 8.3        | 8.5        | 19.0        | 40.0         | 51.3         | 48.6         | 54.2         | 0.0        | 0.0                 | 15.1                | 2.0         |
| Other business services.....   | 731-736,738                         | 1.4        | 15.6             | 7.7                      | 15.0       | 15.7       | 0.0         | 26.1         | 29.2         | 26.7         | 20.0         | 0.0        | 0.0                 | 0.0                 | 0.0         |
| Health services.....   | 80                                  | 37.3       | 25.0             | 6.0                      | 1.4        | 1.2        | 24.3        | 92.0         | 95.1         | 75.8         | 89.9         | 0.0        | 0.0                 | 1.3                 | 0.0         |
| Offices and clinics of medical doctors, hospitals, medical and dental labs | 801,806,807                         | 39.6       | 25.1             | 1.9                      | 0.7        | 0.7        | 0.0         | 95.7         | 97.0         | 86.8         | 94.9         | 0.0        | 0.0                 | 1.3                 | 0.0         |
| Other health services.....   | 802-805,<br>808-809                 | 11.8       | 24.2             | 29.8                     | 10.3       | 8.0        | 100.0       | 16.3         | 13.1         | 10.4         | 12.9         | 0.0        | 0.0                 | 0.0                 | 0.0         |
| Engineering and management services.....                                   | 87                                  | 13.9       | 20.8             | 29.2                     | 24.1       | 9.6        | 51.3        | 53.6         | 56.3         | 55.5         | 49.7         | 5.4        | 0.0                 | 11.8                | 15.0        |
| Engineering, architectural, and surveying.....                             | 871                                 | 2.7        | 5.3              | 43.0                     | 14.6       | 11.2       | 16.8        | 57.2         | 62.2         | 55.7         | 44.6         | 6.1        | 0.0                 | 2.3                 | 8.6         |
| Research, development, and testing.....                                    | 873                                 | 33.1       | 42.4             | 21.5                     | 28.1       | 9.3        | 71.5        | 52.3         | 55.2         | 55.3         | 50.6         | 4.3        | 0.0                 | 12.1                | 16.6        |
| Other engineering and management services...                               | 872,874                             | 23.2       | 23.2             | 15.3                     | 2.3        | 10.5       | 100.0       | 59.3         | 83.4         | 73.6         | 72.8         | 0.0        | 0.0                 | 0.0                 | 0.0         |

See explanatory information and SOURCE at end of table.

Table B-4. Imputation rates for selected items, by industry: 1997

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| Industry   | SIC code                         | Net Sales | Total employment | R&D scientists/engineers | Total R&D |         |         | R&D by cost |           |             | R&D by State | Energy R&D | Pollution abatement | R&D outside company | Foreign R&D |
|--|----------------------------------|-----------|------------------|--------------------------|-----------|---------|---------|-------------|-----------|-------------|--------------|------------|---------------------|---------------------|-------------|
|  |                                  |           |                  |                          | Total     | Company | Federal | Wages       | Materials | Other costs |              |            |                     |                     |             |
| [Percent]  |                                  |           |                  |                          |           |         |         |             |           |             |              |            |                     |                     |             |
| Other services.....                                  | 701,72,<br>75-79,81,<br>83,84,89 | 0.3       | 0.2              | 4.5                      | 2.9       | 3.0     | 0.0     | 22.4        | 30.8      | 28.8        | 15.4         | 0.0        | 0.0                 | 0.2                 | 2.6         |
| Other nonmanufacturing industries <sup>1</sup> ..... | 07-12,14,15,<br>161-162,17       | 1.4       | 1.7              | 27.3                     | 1.8       | 1.9     | 0.0     | 24.0        | 22.0      | 23.5        | 24.4         | 0.0        | 0.0                 | 0.0                 | 10.4        |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table B-5. Reported items--percentage of R&D-performing companies  
that reported data for selected items: 1997**

| Data Item                      | Percent that reported data item <sup>1</sup> |                         |
|--------------------------------|--|-------------------------|
|                                | Form RD-1L <sup>2</sup>                      | Form RD-1A <sup>2</sup> |
| Sales.....                     | 99.1%  | 99.0%                   |
| Total employment.....          | 96.8   | 98.9                    |
| Scientist and engineers.....   | 76.4   | 87.3                    |
| Federal R&D <sup>3</sup> ..... | 98.3   | 100.0                   |
| Company R&D <sup>3</sup> ..... | 98.3   | 100.0                   |
| Total R&D.....                 | 100.0  | 100.0                   |
| Foreign R&D.....               | 24.1   | 4.3                     |
| Contracted out.....            | 18.2   | 12.9                    |
| Energy R&D.....                | 3.9  | 4                       |
| Pollution abatement R&D.....   | 4.5  | 4                       |

<sup>1</sup> Percentages are based on companies that reported total R&D expenditures. Imputed data are not included.

Companies that reported they were out of scope, out of business, merged with another company, or had no R&D expenditures for 1997 were excluded from the calculation.

<sup>2</sup> See technical notes for descriptions of the survey questionnaire forms.

<sup>3</sup> Item response for "Federal R&D" and for "Company R&D" are considered together; companies that report "Total R&D" and either of these expenditures implicitly report both company and Federal R&D, since these two items sum to total R&D.

<sup>4</sup> Percentages are not provided because Form RD-1A, the abbreviated questionnaire, does not include these items. See the technical notes for more information about the contents of the survey questionnaires.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

data were collected and was based on a character of work distribution reported in either of the 2 previous years, if any. It was again performed using new data collected in the next 2 years. If reported data followed no previously imputed or reported data, previous period estimates were inserted based on the currently reported information. Similarly, if reported data did not follow 2 years of imputed data, the 2 years of previously imputed data were removed. Thus, character of work estimates were revised as newly reported information became available and were not final for 2 years following their initial publication.

Beginning with 1995, previously estimated values were not removed for firms that did not report in the third year, nor were estimates made for the 2 previous years for firms reporting after 2 years of nonresponse. This process was changed because, in the prior period, revisions were minimal. Estimates continue to be made for 2 consecutive years of nonresponse and discontinued if the firm does not report character of work in the third year.

If no reported data are available for a firm, character of work estimates are not imputed. As a consequence, only a portion of the total estimated R&D expenditures are distributed at the firm level. Those expenditures not meeting the requirements of the new imputation methodology are placed in a "not distributed" category. Tables B-6, B-7, and B-8 show the character of work estimates along with the "not distributed" component for 1995, 1996, and 1997, respectively. NSF's objective in conducting the survey has always been to provide estimates for the entire population of firms performing R&D in the United States. However, the revised imputation procedure would no longer produce such estimates because of the "not distributed" component. A baseline estimation method was thus developed to allocate the "not

distributed" amounts among the character of work components. In the baseline estimation method, the "not distributed" expenditures are allocated by industry group to basic research, applied research, and development categories using the percentage splits in the distributed category for that industry. The allocation is done at the lowest level of published industry detail only; higher levels are derived by aggregation, just as national totals are derived by aggregation of individual industry estimates, and result in higher performance shares for basic and applied research and lower estimates for development's share than would have been calculated using the previous method.<sup>9</sup> The estimates of basic research, applied research, and development provided in the tables in section A were calculated using the baseline estimation method.

## STATE ESTIMATES

Form RD-1L requests data on the cost of R&D performed for states in which a company's R&D laboratories are located. An independent source, the *Directory of American Research and Development*, published by the Data Base Publishing Group of the R. R. Bowker Company, is used in conjunction with survey results to estimate R&D expenditures by state for companies that do not provide this information. The information on scientists and engineers published in the directory is used as a proxy indicator of the proportion of R&D expenditures within each state. R&D expenditures by state are estimated by applying the distribution of scientists and engineers by state from the directory to total R&D expenditures for these companies. These estimates are included with reported survey data to arrive at published estimates of R&D expenditures for each state.

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<sup>9</sup>See NSF (1990) for an explanation of the uncertainties in the data and to quantify their sensitivity to the choice of various possible imputation procedures.

**Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1995**

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| Industry and size of company                                | SIC code       | Total                 |           |         | Basic research |         |         | Applied research |         |         |
|---|----------------|-----------------------|-----------|---------|----------------|---------|---------|------------------|---------|---------|
|   |                | Total                 | Federal   | Company | Total          | Federal | Company | Total            | Federal | Company |
|   |                | [Dollars in millions] |           |         |                |         |         |                  |         |         |
| All Industries.....   |                | 132,103               | 23,451    | 108,652 | 5,093          | 511     | 4,581   | 22,470           | 2,725   | 19,744  |
| Distribution by industry:                                   |                |                       |           |         |                |         |         |                  |         |         |
| Manufacturing.....  |                | 100,067               | 18,831    | 81,236  | 3,086          | 207     | 2,879   | 16,154           | 1,575   | 14,579  |
| Food, kindred, and tobacco products.....                    | 20,21          | 1,566                 | 0         | 1,566   | 136            | 0       | 136     | 453              | 0       | 453     |
| Textiles and apparel.....                                   | 22,23          | (D)                   | (D)       | 381     | 22             | 0       | 22      | (D)              | (D)     | 37      |
| Lumber, wood products, and furniture.....                   | 24,25          | (D)                   | (D)       | 229     | 17             | 0       | 17      | 31               | 0       | 31      |
| Paper and allied products.....                              | 26             | (D)                   | (D)       | 1,404   | 193 (S)        | 0       | 193 (S) | (D)              | (D)     | 556 (S) |
| Chemicals and allied products.....                          | 28             | 17,547                | 210 (S)   | 17,337  | (D)            | (D)     | 1,225   | (D)              | (D)     | 4,348   |
| Industrial chemicals.....                                   | 281-82,286     | (D)                   | (D)       | 5,139   | (D)            | (D)     | 426     | (D)              | (D)     | 1,191   |
| Drugs and medicines.....                                    | 283            | 10,215                | 14        | 10,202  | 720            | 2       | 718     | 2,484            | 5       | 2,479   |
| Other chemicals.....  | 284-85,287-89  | (D)                   | (D)       | 1,996   | (D)            | (D)     | 81      | (D)              | (D)     | 678     |
| Petroleum refining and extraction.....                      | 13,29          | 1,760                 | 6         | 1,754   | 84             | 0       | 84      | (D)              | (D)     | 523     |
| Rubber products.....  | 30             | (D)                   | (D)       | 1,210   | 55             | 0       | 55      | (D)              | (D)     | 174     |
| Stone, clay, and glass products.....                        | 32             | 448                   | 6         | 441     | 15             | 0       | 15      | (D)              | (D)     | 136     |
| Primary metals.....   | 33             | 593                   | 13        | 580     | 30             | 0       | 30      | (D)              | (D)     | 134     |
| Ferrous metals and products.....                            | 331-32,3398-99 | (D)                   | (D)       | 217     | 13             | 0       | 13      | 77               | 0       | 77      |
| Nonferrous metals and products.....                         | 333-36         | (D)                   | (D)       | 363     | 18             | 0       | 18      | (D)              | (D)     | 57      |
| Fabricated metal products.....                              | 34             | 1,023                 | 86        | 937     | (D)            | (D)     | 60      | 138              | 9       | 128     |
| Machinery.....  | 35             | (D)                   | (D)       | 9,676   | (D)            | (D)     | 220     | 2,153            | 27      | 2,126   |
| Office, computing, and accounting machines.....             | 357            | (D)                   | (D)       | 4,699   | (D)            | (D)     | 22      | (D)              | (D)     | 1,227   |
| Other machinery, except electrical.....                     | 351-56,358-59  | 5,041                 | 64        | 4,976   | (D)            | (D)     | 198     | (D)              | (D)     | 899     |
| Electrical equipment.....                                   | 36             | 18,751                | 1,690     | 17,060  | (D)            | (D)     | 178     | (D)              | (D)     | 2,229   |
| Radio and TV receiving equipment.....                       | 365            | (D)                   | (D)       | 114     | 4              | 0       | 4       | 13               | 0       | 13      |
| Communication equipment.....                                | 366            | (D)                   | (D)       | 3,845   | 48             | 0       | 48      | (D)              | (D)     | 568     |
| Electronic components.....                                  | 367            | (D)                   | (D)       | 9,628   | (D)            | (D)     | 50      | 1,207            | 33      | 1,174   |
| Other electrical equipment.....                             | 361-64,369     | (D)                   | (D)       | 3,473   | (D)            | (D)     | 76      | (D)              | (D)     | 474     |
| Transportation equipment.....                               | 37             | 32,441                | 13,130    | 19,311  | 280            | 180     | 100     | 2,248            | 548     | 1,700   |
| Motor vehicles and motor vehicles equipment.....            | 371            | (D)                   | (D)       | 13,590  | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Other transportation equipment.....                         | 373-75,379     | (D)                   | (D)       | 232     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Aircraft and missiles.....                                  | 372,376        | 16,951                | 11,462    | 5,489   | 185            | 180     | 5       | 1,459            | 406     | 1,052   |
| Professional and scientific instruments.....                | 38             | 11,976                | 3,460 (S) | 8,516   | (D)            | (D)     | 472     | (D)              | (D)     | 1,929   |
| Scientific and mechanical measuring instruments....         | 381-82         | 7,146                 | 3,358 (S) | 3,787   | (D)            | (D)     | 252     | (D)              | (D)     | 1,373   |
| Optical, surgical, photographic, and other instruments..... | 384-87         | 4,831                 | 102       | 4,729   | (D)            | (D)     | 220     | 579              | 23      | 556     |
| Other manufacturing industries.....                         | 27,31,39       | (D)                   | (D)       | 835     | (D)            | (D)     | 71      | 73               | 0       | 73      |

See explanatory information and SOURCE at end of table.

**Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1995**

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| Industry and size of company   | SIC code                        | Total                 |         |         | Basic research |         |         | Applied research |         |         |
|--|---------------------------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|
|  |                                 | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company |
|  |                                 | [Dollars in millions] |         |         |                |         |         |                  |         |         |
| Distribution by industry:  |                                 |                       |         |         |                |         |         |                  |         |         |
| Nonmanufacturing .....   |                                 | 32,036                | 4,620   | 27,415  | 2,006          | 304     | 1,702   | 6,316            | 1,150   | 5,166   |
| Transportation and utilities.....  | 40-42,44-49                     | 5,435                 | 252     | 5,183   | (D)            | (D)     | 106     | (D)              | (D)     | 938     |
| Communications.....  | 48                              | (D)                   | (D)     | 4,756   | (D)            | 0       | (D)     | (D)              | 0       | (D)     |
| Telephone communications.....  | 481                             | (D)                   | (D)     | 4,697   | (D)            | 0       | (D)     | (D)              | 0       | (D)     |
| Other communications.....  | 482-484,489                     | 59                    | 0       | 59      | (D)            | 0       | (D)     | (D)              | 0       | (D)     |
| Electric, gas, and sanitary services.....  | 49                              | 440                   | 93      | 347     | (D)            | (D)     | 43      | (D)              | (D)     | 93      |
| Other transportation and utilities.....  | 40-42,44-47                     | (D)                   | (D)     | 80      | (D)            | 0       | (D)     | (D)              | (D)     | (D)     |
| Trade.....   | 50-59                           | (D)                   | (D)     | 7,514   | (D)            | (D)     | 207     | (D)              | (D)     | 1,213   |
| Finance, insurance, and real estate.....   | 60-65,67                        | (D)                   | (D)     | 710     | (D)            | (D)     | 115     | (D)              | (D)     | 16      |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 17,876                | 4,270   | 13,606  | 1,537          | 294     | 1,243   | 3,979            | 1,129   | 2,850   |
| Business services.....   | 73                              | 9,293                 | 612     | 8,681   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Computer and data processing services.....   | 737                             | 9,059                 | 514     | 8,545   | (D)            | (D)     | 550     | (D)              | (D)     | 1,338   |
| Other business services.....   | 731-736,738                     | 234                   | 98      | 136     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Health services.....   | 80                              | 756                   | 4       | 753     | (D)            | (D)     | (D)     | 237              | 3       | 235     |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | (D)                   | (D)     | 737     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Other health services.....   | 802-805,808-809                 | (D)                   | (D)     | 16 (S)  | 1              | (D)     | (D)     | (D)              | (D)     | (D)     |
| Engineering and management services.....   | 87                              | 7,662                 | 3,650   | 4,011   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Engineering, architectural, and surveying.....                                     | 871                             | 2,933                 | 1,883   | 1,050   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Research, development, and testing.....  | 873                             | (D)                   | (D)     | 2,829   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Other engineering and management services....                                      | 872,874                         | (D)                   | (D)     | 132     | (D)            | (D)     | 7       | (D)              | (D)     | 0       |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | 165                   | 4       | 160     | (D)            | (D)     | (D)     | 29               | 3       | 26      |
| Other nonmanufacturing industries.....   | 07-12,14,15,<br>161-162,17      | 413                   | 11      | 402     | 31             | 0       | 31      | (D)              | (D)     | 148     |

See explanatory information and SOURCE at end of table.

**Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1995**

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| Industry and size of company                              | SIC code | Total                 |           |         | Basic research |         |         | Applied research |         |         |
|---|----------|-----------------------|-----------|---------|----------------|---------|---------|------------------|---------|---------|
|   |          | Total                 | Federal   | Company | Total          | Federal | Company | Total            | Federal | Company |
|   |          | [Dollars in millions] |           |         |                |         |         |                  |         |         |
| Distribution by size of company:<br>[Number of employees] |          |                       |           |         |                |         |         |                  |         |         |
| Total.....  |          | 132,103               | 23,451    | 108,652 | 5,093          | 511     | 4,581   | 22,470           | 2,725   | 19,744  |
| Fewer than 500.....                                       |          | 16,662                | 1,978     | 14,684  | 1,872          | 272     | 1,600   | 4,457            | 789     | 3,668   |
| 500 to 999.....   |          | 4,693                 | 225       | 4,468   | (D)            | (D)     | 266     | (D)              | (D)     | 1,121   |
| 1,000 to 4,999.....                                       |          | 16,960                | 798       | 16,162  | 1,263          | 26 (S)  | 1,237   | 3,220            | 42      | 3,177   |
| 5,000 to 9,999.....                                       |          | 9,532                 | 243       | 9,289   | (D)            | (D)     | 187     | 2,203            | 60 (S)  | 2,143   |
| 10,000 to 24,999.....                                     |          | 17,071                | 1,946 (S) | 15,125  | 559            | 3       | 556     | (D)              | (D)     | 2,351   |
| 25,000 or more.....                                       |          | 67,185                | 18,261    | 48,924  | 922            | 186     | 736     | 8,638            | 1,354   | 7,284   |

See explanatory information and SOURCE at end of table.

**Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1995**

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| Industry and size of company                                | SIC code       | Development           |           |           | Expenditures not distributed |         |           | Percent of expenditures not distributed |         |         |
|---|----------------|-----------------------|-----------|-----------|------------------------------|---------|-----------|---|---------|---------|
|   |                | Total                 | Federal   | Company   | Total                        | Federal | Company   | Total                                   | Federal | Company |
|   |                | [Dollars in millions] |           |           |                              |         |           | [Percent]                               |         |         |
| All Industries.....   |                | 83,616                | 14,679    | 68,938    | 20,925                       | 5,536   | 15,388    | 16.0                                    | 24.0    | 14.0    |
| Distribution by industry:                                   |                |                       |           |           |                              |         |           |   |         |         |
| Manufacturing.....  |                | 62,201                | 12,746    | 49,455    | 18,626                       | 4,302   | 14,324    | 19.0                                    | 23.0    | 18.0    |
| Food, kindred, and tobacco products .....                   | 20,21          | 803                   | 0         | 803       | 174                          | 0       | 174       | 11.0                                    | 0.0     | 11.0    |
| Textiles and apparel.....                                   | 22,23          | (D)                   | (D)       | 228       | (D)                          | (D)     | 94        | (D)                                     | (D)     | 25.0    |
| Lumber, wood products, and furniture.....                   | 24,25          | (D)                   | (D)       | 136       | (D)                          | (D)     | 45        | (D)                                     | (D)     | 20.0    |
| Paper and allied products.....                              | 26             | 345                   | 0         | 345       | (D)                          | (D)     | 310       | (D)                                     | (D)     | 22.0    |
| Chemicals and allied products.....                          | 28             | 7,936                 | 186 (S)   | 7,750     | (D)                          | (D)     | 4,013     | (D)                                     | (D)     | 23.0    |
| Industrial chemicals.....                                   | 281-82,286     | (D)                   | (D)       | 2,619     | (D)                          | (D)     | 903       | (D)                                     | (D)     | 18.0    |
| Drugs and medicines.....                                    | 283            | 4,018                 | 7         | 4,011     | 2,994                        | 0       | 2,994     | 29.0                                    | 0.0     | 29.0    |
| Other chemicals.....  | 284-85,287-89  | (D)                   | (D)       | 1,119     | (D)                          | (D)     | 117       | (D)                                     | (D)     | 6.0     |
| Petroleum refining and extraction.....                      | 13,29          | (D)                   | (D)       | 669       | (D)                          | 0       | 478 (D)   | (D)                                     | 0.0     | (D)     |
| Rubber products.....  | 30             | (D)                   | (D)       | 753       | (D)                          | (D)     | 228       | (D)                                     | (D)     | 19.0    |
| Stone, clay, and glass products.....                        | 32             | (D)                   | (D)       | 249       | 41                           | 0       | 41 (D)    | 9.0                                     | 0.0     | 9.0     |
| Primary metals.....   | 33             | (D)                   | (D)       | 236       | (D)                          | (D)     | 179       | (D)                                     | (D)     | 31.0    |
| Ferrous metals and products.....                            | 331-32,3398-99 | (D)                   | (D)       | 108       | (D)                          | (D)     | 19 (D)    | (D)                                     | (D)     | (D)     |
| Nonferrous metals and products.....                         | 333-36         | 130                   | 2         | 128       | (D)                          | (D)     | 160 (D)   | 45.0                                    | 64.0    | (D)     |
| Fabricated metal products.....                              | 34             | (D)                   | (D)       | 654       | (D)                          | (D)     | 95        | (D)                                     | (D)     | 10.0    |
| Machinery.....  | 35             | 6,209                 | 48        | 6,162     | (D)                          | (D)     | 1,168     | 12.0                                    | 10.0    | 12.0    |
| Office, computing, and accounting machines.....             | 357            | (D)                   | (D)       | 3,111 (S) | (D)                          | (D)     | 339       | (D)                                     | (D)     | 7.0     |
| Other machinery, except electrical.....                     | 351-56,358-59  | (D)                   | (D)       | 3,051     | (D)                          | (D)     | 829       | (D)                                     | (D)     | 17.0    |
| Electrical equipment.....                                   | 36             | 9,689                 | 446       | 9,243     | (D)                          | (D)     | 5,410     | (D)                                     | (D)     | 32.0    |
| Radio and TV receiving equipment.....                       | 365            | (D)                   | (D)       | 78        | (D)                          | (D)     | 18        | (D)                                     | (D)     | 16.0    |
| Communication equipment.....                                | 366            | 3,119                 | 52        | 3,067     | (D)                          | (D)     | 162 (D)   | 14.0                                    | 90.0    | (D)     |
| Electronic components.....                                  | 367            | 3,820                 | 13        | 3,807     | (D)                          | (D)     | 4,598 (D) | 50.0                                    | 92.0    | (D)     |
| Other electrical equipment.....                             | 361-64,369     | (D)                   | (D)       | 2,292     | (D)                          | (D)     | 631       | 16.0                                    | 0.0     | 18.0    |
| Transportation equipment.....                               | 37             | 25,250                | 9,192     | 16,057    | 4,663                        | 3,211   | 1,453     | 14.0                                    | 24.0    | 8.0     |
| Motor vehicles and motor vehicles equipment.....            | 371            | (D)                   | (D)       | 12,807    | (D)                          | (D)     | 83        | (D)                                     | (D)     | 1.0     |
| Other transportation equipment.....                         | 373-75,379     | (D)                   | (D)       | 118       | (D)                          | (D)     | 72        | 14.0                                    | 1.0     | 31.0    |
| Aircraft and missiles.....                                  | 372,376        | 10,802                | 7,669     | 3,133     | 4,504                        | 3,206   | 1,298     | 27.0                                    | 28.0    | 24.0    |
| Professional and scientific instruments.....                | 38             | 8,384                 | 2,795 (S) | 5,589     | (D)                          | (D)     | 526       | (D)                                     | (D)     | 6.0     |
| Scientific and mechanical measuring instruments...          | 381-82         | (D)                   | (D)       | 2,052     | (D)                          | (D)     | 110 (S)   | (D)                                     | (D)     | 3.0     |
| Optical, surgical, photographic, and other instruments..... | 384-87         | (D)                   | (D)       | 3,537     | (D)                          | (D)     | 416       | (D)                                     | (D)     | 9.0     |
| Other manufacturing industries .....                        | 27,31,39       | 581                   | 0         | 581       | (D)                          | (D)     | 110       | (D)                                     | (D)     | 13.0    |

See explanatory information and SOURCE at end of table.

**Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1995**

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| Industry and size of company   | SIC code                        | Development           |           |         | Expenditures not distributed |         |         | Percent of expenditures not distributed |         |         |
|--|---------------------------------|-----------------------|-----------|---------|------------------------------|---------|---------|---|---------|---------|
|  |                                 | Total                 | Federal   | Company | Total                        | Federal | Company | Total                                   | Federal | Company |
|  |                                 | [Dollars in millions] |           |         |                              |         |         | [Percent]                               |         |         |
| <b>Distribution by industry:</b>   |                                 |                       |           |         |                              |         |         |   |         |         |
| Nonmanufacturing .....   |                                 | 21,415                | 1,932     | 19,483  | 2,299                        | 1,234   | 1,065   | 7.0                                     | 27.0    | 4.0     |
| Transportation and utilities.....  | 40-41,44-49                     | 4,285                 | 232       | 4,053   | (D)                          | (D)     | 85      | (D)                                     | (D)     | 2.0     |
| Communications.....  | 48                              | (D)                   | (D)       | 3,849   | (D)                          | 0       | (D)     | 0.0                                     | 0.0     | 0.0     |
| Telephone communications.....  | 481                             | (D)                   | (D)       | 3,809   | 0                            | 0       | 0       | 0.0                                     | 0.0     | 0.0     |
| Other communications.....  | 482-484,489                     | 41                    | 0         | 41      | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Electric, gas, and sanitary services.....  | 49                              | 250                   | 86        | 163     | (D)                          | 0       | 48      | 11.0                                    | 0.0     | 14.0    |
| Other transportation and utilities.....  | 40-42,44-47                     | (D)                   | (D)       | 40      | (D)                          | (D)     | (D)     | 51.0                                    | 100.0   | (D)     |
| Trade.....   | 50-59                           | (D)                   | (D)       | 5,956   | (D)                          | (D)     | 139     | (D)                                     | (D)     | 2.0     |
| Finance, insurance, and real estate.....   | 60-65,67                        | (D)                   | (D)       | 575     | (D)                          | (D)     | 4       | (D)                                     | (D)     | 1.0     |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 10,315                | 1,626     | 8,690   | 2,045                        | 1,221   | 823     | 11.0                                    | 29.0    | 6.0     |
| Business services.....   | 73                              | 6,691                 | 258       | 6,434   | (D)                          | (D)     | (D)     | (D)                                     | (D)     | (D)     |
| Computer and data processing services.....   | 737                             | 6,533                 | 178       | 6,355   | (D)                          | (D)     | 301     | (D)                                     | (D)     | 4.0     |
| Other business services.....   | 731-736,738                     | 158                   | 80        | 78      | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Health services.....   | 80                              | (D)                   | (D)       | (D)     | 0                            | 0       | 0       | 0.0                                     | 0.0     | 0.0     |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | (D)                   | (D)       | (D)     | 0                            | 0       | 0       | 0.0                                     | 0.0     | 0.0     |
| Other health services.....   | 802-805,808-809                 | 7                     | 0         | 7       | 0                            | 0       | 0       | 0.0                                     | 0.0     | 0.0     |
| Engineering and management services.....   | 87                              | 3,031                 | 1,367 (S) | 1,664   | (D)                          | (D)     | 498     | (D)                                     | (D)     | 12.0    |
| Engineering, architectural, and surveying.....                                     | 871                             | 799                   | 482       | 317     | (D)                          | (D)     | (D)     | (D)                                     | (D)     | (D)     |
| Research, development, and testing.....  | 873                             | (D)                   | (D)       | 1,222   | (D)                          | (D)     | (D)     | 6.0                                     | 7.0     | (D)     |
| Other engineering and management services....                                      | 872,874                         | (D)                   | (D)       | 125     | 0                            | 0       | 0       | 0.0                                     | 0.0     | 0.0     |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | (D)                   | (D)       | (D)     | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Other nonmanufacturing industries .....  | 07-12,14,15,<br>161-162,17      | (D)                   | (D)       | 209     | 13                           | 0       | 13      | 3.0                                     | 0.0     | 3.0     |

See explanatory information and SOURCE at end of table.

**Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1995**

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| Industry and size of company                              | SIC code | Development           |           |         | Expenditures not distributed |         |         | Percent of expenditures not distributed |         |         |
|---|----------|-----------------------|-----------|---------|------------------------------|---------|---------|---|---------|---------|
|   |          | Total                 | Federal   | Company | Total                        | Federal | Company | Total                                   | Federal | Company |
|   |          | [Dollars in millions] |           |         |                              |         |         | [Percent]                               |         |         |
| Distribution by size of company:<br>[Number of employees] |          |                       |           |         |                              |         |         |   |         |         |
| Total.....  |          | 83,616                | 14,679    | 68,938  | 20,925                       | 5,536   | 15,388  | 16.0                                    | 24.0    | 14.0    |
| Fewer than 500.....                                       |          | 9,406                 | 847       | 8,559   | 926                          | 69      | 857     | 6.0                                     | 3.0     | 6.0     |
| 500 to 999.....   |          | 2,907                 | 156       | 2,751   | (D)                          | (D)     | 330 (S) | (D)                                     | (D)     | 7.0     |
| 1,000 to 4,999.....                                       |          | 10,617                | 633       | 9,984   | 1,860                        | 96      | 1,764   | 11.0                                    | 12.0    | 11.0    |
| 5,000 to 9,999.....                                       |          | 6,444                 | 153 (S)   | 6,291   | (D)                          | (D)     | 669     | (D)                                     | (D)     | 7.0     |
| 10,000 to 24,999.....                                     |          | 10,386                | 1,377 (S) | 9,009   | (D)                          | (D)     | 3,209   | (D)                                     | (D)     | 21.0    |
| 25,000 or more.....                                       |          | 43,856                | 11,513    | 32,343  | 13,768                       | 5,208   | 8,560   | 20.0                                    | 29.0    | 17.0    |

**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1996**

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| Industry and size of company                                | SIC code       | Total                 |         |         | Basic research |         |         | Applied research |         |         |
|---|----------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|
|   |                | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company |
|   |                | [Dollars in millions] |         |         |                |         |         |                  |         |         |
| All Industries.....   |                | 144,667               | 23,653  | 121,015 | 7,011          | 1,114   | 5,897   | 24,386           | 3,013   | 21,373  |
| Distribution by industry:                                   |                |                       |         |         |                |         |         |                  |         |         |
| Manufacturing.....  |                | 111,864               | 20,020  | 91,845  | (D)            | (D)     | 3,948   | (D)              | (D)     | 15,714  |
| Food, kindred, and tobacco products.....                    | 20,21          | 1,564                 | 0       | 1,564   | 87             | 0       | 87      | 443              | 0       | 443     |
| Textiles and apparel.....                                   | 22,23          | (D)                   | (D)     | 414     | 37             | 0       | 37      | (D)              | (D)     | 32      |
| Lumber, wood products, and furniture.....                   | 24,25          | (D)                   | (D)     | 634     | 29             | 0       | 29      | (D)              | (D)     | 94      |
| Paper and allied products.....                              | 26             | (D)                   | (D)     | 1,534   | 255 (S)        | 0       | 255 (S) | (D)              | (D)     | 567 (S) |
| Chemicals and allied products.....                          | 28             | (D)                   | (D)     | 17,520  | 1,322          | 8       | 1,314   | (D)              | (D)     | 4,651   |
| Industrial chemicals.....                                   | 281-82,286     | (D)                   | (D)     | 5,246   | (D)            | (D)     | 599     | (D)              | (D)     | 1,260   |
| Drugs and medicines.....                                    | 283            | 9,773                 | 3       | 9,769   | (D)            | (D)     | 651     | (D)              | (D)     | 2,401   |
| Other chemicals.....  | 284-85,287-89  | 2,505                 | 0       | 2,505   | 64             | 0       | 64      | 991              | 0       | 991     |
| Petroleum refining and extraction.....                      | 13,29          | 1,654                 | 24      | 1,630   | (D)            | (D)     | (D)     | 416              | 2       | 414     |
| Rubber products.....  | 30             | (D)                   | (D)     | 1,269   | (D)            | (D)     | 55      | (D)              | (D)     | 188     |
| Stone, clay, and glass products.....                        | 32             | 468                   | 5       | 463     | (D)            | (D)     | 19      | (D)              | (D)     | 148     |
| Primary metals.....   | 33             | (D)                   | (D)     | 637     | (D)            | (D)     | (D)     | (D)              | (D)     | 138     |
| Ferrous metals and products.....                            | 331-32,3398-99 | (D)                   | (D)     | 214     | 5              | (D)     | (D)     | (D)              | 0       | (D)     |
| Nonferrous metals and products.....                         | 333-36         | (D)                   | (D)     | 422     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     |
| Fabricated metal products.....                              | 34             | (D)                   | (D)     | 1,322   | (D)            | (D)     | 86      | (D)              | (D)     | 152     |
| Machinery.....  | 35             | 13,455                | 117     | 13,338  | (D)            | (D)     | 337     | (D)              | (D)     | 2,150   |
| Office, computing, and accounting machines.....             | 357            | (D)                   | (D)     | 8,132   | (D)            | (D)     | 59      | (D)              | (D)     | 1,498   |
| Other machinery, except electrical.....                     | 351-56,358-59  | (D)                   | (D)     | 5,206   | (D)            | (D)     | 278     | (D)              | (D)     | 653     |
| Electrical equipment.....                                   | 36             | 22,498                | 2,143   | 20,356  | (D)            | (D)     | 443     | (D)              | (D)     | 3,389   |
| Radio and TV receiving equipment.....                       | 365            | (D)                   | (D)     | 140     | 21             | (D)     | (D)     | (D)              | 0       | (D)     |
| Communication equipment.....                                | 366            | (D)                   | (D)     | 4,359   | (D)            | (D)     | 59      | (D)              | (D)     | 662     |
| Electronic components.....                                  | 367            | (D)                   | (D)     | 12,497  | (D)            | (D)     | (D)     | 2,665            | (D)     | (D)     |
| Other electrical equipment.....                             | 361-64,369     | (D)                   | (D)     | 3,360   | (D)            | (D)     | 217     | (D)              | (D)     | 545     |
| Transportation equipment.....                               | 37             | 32,737                | 12,202  | 20,535  | (D)            | (D)     | 190     | (D)              | (D)     | 1,992   |
| Motor vehicles and motor vehicles equipment.....            | 371            | (D)                   | (D)     | 14,528  | 103            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Other transportation equipment.....                         | 373-75,379     | (D)                   | (D)     | 298     | (D)            | 0       | (D)     | 86               | (D)     | (D)     |
| Aircraft and missiles.....                                  | 372,376        | 16,224                | 10,515  | 5,710   | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Professional and scientific instruments.....                | 38             | 12,149                | 3,942   | 8,207   | (D)            | (D)     | 789     | 934              | 52      | 882     |
| Scientific and mechanical measuring instruments...          | 381-82         | (D)                   | (D)     | 3,283   | (D)            | (D)     | 315     | 333              | 18      | 315     |
| Optical, surgical, photographic, and other instruments..... | 384-87         | (D)                   | (D)     | 4,924   | (D)            | (D)     | 474     | 600              | 34      | 567     |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39       | (D)                   | (D)     | 2,423   | (D)            | (D)     | 234     | 924              | 451     | 473     |

See explanatory information and SOURCE at end of table.

**Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1996**

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| Industry and size of company   | SIC code                        | Total                 |           |         | Basic research |         |         | Applied research |           |         |
|--|---------------------------------|-----------------------|-----------|---------|----------------|---------|---------|------------------|-----------|---------|
|  |                                 | Total                 | Federal   | Company | Total          | Federal | Company | Total            | Federal   | Company |
|  |                                 | [Dollars in millions] |           |         |                |         |         |                  |           |         |
| <b>Distribution by industry:</b>   |                                 |                       |           |         |                |         |         |                  |           |         |
| Nonmanufacturing.....  |                                 | 32,803                | 3,633     | 29,170  | (D)            | (D)     | 1,949   | (D)              | (D)       | 5,659   |
| Transportation and utilities.....  | 40-42,44-49                     | 4,678                 | 186       | 4,492   | (D)            | (D)     | (D)     | (D)              | (D)       | (D)     |
| Communications.....  | 48                              | (D)                   | (D)       | 3,970   | (D)            | 0       | (D)     | (D)              | (D)       | (D)     |
| Telephone communications.....  | 481                             | (D)                   | (D)       | 3,897   | (D)            | 0       | (D)     | (D)              | (D)       | (D)     |
| Other communications.....  | 482-484,489                     | 73                    | 0         | 73      | (D)            | 0       | (D)     | 16               | (D)       | (D)     |
| Electric, gas, and sanitary services.....  | 49                              | 352                   | 42        | 311     | 14             | 0       | 14      | (D)              | (D)       | 73      |
| Other transportation and utilities.....  | 40-42,44-47                     | (D)                   | (D)       | 211     | (D)            | (D)     | (D)     | (D)              | 0         | (D)     |
| Trade.....   | 50-59                           | 6,389                 | 51 (S)    | 6,338   | (D)            | (D)     | 391     | 1,462            | 0         | 1,462   |
| Finance, insurance, and real estate.....   | 60-65,67                        | (D)                   | (D)       | 1,280   | 12             | (D)     | (D)     | (D)              | 0         | (D)     |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 19,022                | 3,118     | 15,904  | 1,618          | 306     | 1,312   | 3,952            | 1,006 (S) | 2,946   |
| Business services.....   | 73                              | 10,641                | 361       | 10,280  | 550            | 48      | 501     | 1,328            | 51        | 1,277   |
| Computer and data processing services.....   | 737                             | (D)                   | (D)       | 10,025  | 510            | 48      | 461     | (D)              | (D)       | 1,244   |
| Other business services.....   | 731-736,738                     | (D)                   | (D)       | 255     | 40             | 0       | 40      | (D)              | (D)       | 33      |
| Health services.....   | 80                              | (D)                   | (D)       | 735 (S) | (D)            | (D)     | 51      | (D)              | (D)       | 252 (S) |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | 715 (S)               | 3         | 713 (S) | 48             | (D)     | (D)     | (D)              | (D)       | (D)     |
| Other health services.....   | 802-805,808-809                 | (D)                   | (D)       | 23      | (D)            | 0       | (D)     | 12               | (D)       | (D)     |
| Engineering and management services.....   | 87                              | 7,318                 | 2,746     | 4,572   | 992            | 256     | 735     | 2,324            | 949 (S)   | 1,376   |
| Engineering, architectural, and surveying.....                                     | 871                             | 1,660                 | 994       | 667     | (D)            | (D)     | (D)     | (D)              | (D)       | (D)     |
| Research, development, and testing.....  | 873                             | 5,484                 | 1,708 (S) | 3,776   | 762            | 114     | 648     | 1,772            | 603 (S)   | 1,168   |
| Other engineering and management services....                                      | 872,874                         | 173                   | 45        | 129     | (D)            | (D)     | (D)     | (D)              | (D)       | (D)     |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | (D)                   | (D)       | 317     | (D)            | (D)     | 24      | (D)              | (D)       | 42      |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | (D)                   | (D)       | 1,156   | 44             | 0       | 44      | 547              | 218       | 329     |

See explanatory information and SOURCE at end of table.

**Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1996**

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| Industry and size of company                              | SIC code | Total                 |           |         | Basic research |         |         | Applied research |         |         |
|---|----------|-----------------------|-----------|---------|----------------|---------|---------|------------------|---------|---------|
|   |          | Total                 | Federal   | Company | Total          | Federal | Company | Total            | Federal | Company |
|   |          | [Dollars in millions] |           |         |                |         |         |                  |         |         |
| Distribution by size of company:<br>[Number of employees] |          |                       |           |         |                |         |         |                  |         |         |
| Total.....  |          | 144,667               | 23,653    | 121,015 | 7,011          | 1,114   | 5,897   | 24,386           | 3,013   | 21,373  |
| Fewer than 500.....                                       |          | 20,249                | 2,301     | 17,948  | 2,075          | 231     | 1,844   | 5,264            | 1,159   | 4,105   |
| 500 to 999.....   |          | 4,637                 | 219       | 4,418   | (D)            | (D)     | 443     | (D)              | (D)     | 1,080   |
| 1,000 to 4,999.....                                       |          | 18,273                | 512       | 17,761  | 1,355          | 78      | 1,277   | 3,597            | 59      | 3,538   |
| 5,000 to 9,999.....                                       |          | 11,537                | 468       | 11,068  | (D)            | (D)     | 353     | 2,160            | 168     | 1,992   |
| 10,000 to 24,999.....                                     |          | 20,164                | 1,031 (S) | 19,133  | 1,136          | 3 (S)   | 1,133   | 3,613            | 63 (S)  | 3,550   |
| 25,000 or more.....                                       |          | 69,808                | 19,122    | 50,686  | (D)            | (D)     | 847     | (D)              | (D)     | 7,108   |

See explanatory information and SOURCE at end of table.

**Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1996**

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| Industry and size of company                                | SIC code       | Development           |            |         | Expenditures not distributed |         |         | Percent of expenditures not distributed |         |         |
|---|----------------|-----------------------|------------|---------|------------------------------|---------|---------|---|---------|---------|
|   |                | Total                 | Federal    | Company | Total                        | Federal | Company | Total                                   | Federal | Company |
|   |                | [Dollars in millions] |            |         |                              |         |         | [Percent]                               |         |         |
| <b>Distribution by industry:</b>                            |                |                       |            |         |                              |         |         |   |         |         |
| All Industries.....   |                | 91,852                | 14,420 (S) | 77,434  | 21,418                       | 5,106   | 16,311  | 14.8                                    | 21.6    | 13.5    |
| Manufacturing.....  |                | 69,607                | 12,741     | 56,868  | 20,004                       | 4,689   | 15,315  | 17.9                                    | 23.4    | 16.7    |
| Food, kindred, and tobacco products .....                   | 20,21          | 835                   | 0          | 835     | 199                          | 0       | 199     | 12.7                                    | 0.0     | 12.7    |
| Textiles and apparel.....                                   | 22,23          | (D)                   | (D)        | 236     | (D)                          | (D)     | 109     | 26.2                                    | 0.0     | 26.3    |
| Lumber, wood products, and furniture.....                   | 24,25          | 371                   | 0          | 371     | (D)                          | (D)     | 140     | 21.9                                    | 9.1     | 22.1    |
| Paper and allied products.....                              | 26             | (D)                   | (D)        | 420     | (D)                          | (D)     | 292     | 18.5                                    | 0.0     | 19.0    |
| Chemicals and allied products.....                          | 28             | (D)                   | (D)        | 8,297   | (D)                          | (D)     | (D)     | 18.1                                    | 0.0     | (D)     |
| Industrial chemicals.....                                   | 281-82,286     | (D)                   | (D)        | 2,590   | (D)                          | (D)     | (D)     | 13.9                                    | 0.0     | (D)     |
| Drugs and medicines.....                                    | 283            | 4,379                 | 2 (S)      | 4,376   | 2,341                        | 0       | 2,341   | 24.0                                    | 0.0     | 24.0    |
| Other chemicals.....  | 284-85,287-89  | 1,329                 | 0          | 1,329   | 121                          | 0       | 121     | 4.8                                     | 0.0     | 4.8     |
| Petroleum refining and extraction.....                      | 13,29          | (D)                   | (D)        | (D)     | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Rubber products.....  | 30             | (D)                   | (D)        | 780     | (D)                          | (D)     | 246     | 17.7                                    | 0.0     | 19.4    |
| Stone, clay, and glass products.....                        | 32             | (D)                   | (D)        | 255     | 41                           | 0       | 41      | 8.8                                     | 0.0     | 8.9     |
| Primary metals.....   | 33             | 598 (S)               | (D)        | (D)     | 190                          | (D)     | (D)     | 20.0                                    | 1.0     | (D)     |
| Ferrous metals and products.....                            | 331-32,3398-99 | (D)                   | (D)        | (D)     | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Nonferrous metals and products.....                         | 333-36         | (D)                   | (D)        | 176     | (D)                          | (D)     | (D)     | 22.7                                    | 1.0     | (D)     |
| Fabricated metal products.....                              | 34             | (D)                   | (D)        | 594     | (D)                          | (D)     | 490     | 38.7                                    | 75.0    | 37.1    |
| Machinery.....  | 35             | 9,412                 | 67         | 9,345   | (D)                          | (D)     | 1,506   | (D)                                     | (D)     | 11.3    |
| Office, computing, and accounting machines.....             | 357            | (D)                   | (D)        | 5,920   | (D)                          | (D)     | 655     | 8.0                                     | 0.0     | 8.1     |
| Other machinery, except electrical.....                     | 351-56,358-59  | (D)                   | (D)        | 3,424   | (D)                          | (D)     | 851     | 16.3                                    | 13.6    | 16.3    |
| Electrical equipment.....                                   | 36             | 11,075                | 316        | 10,761  | (D)                          | (D)     | 5,763   | (D)                                     | (D)     | 28.3    |
| Radio and TV receiving equipment.....                       | 365            | (D)                   | (D)        | 102     | (D)                          | 0       | (D)     | 5.0                                     | 0.0     | (D)     |
| Communication equipment.....                                | 366            | 3,466                 | 30         | 3,437   | (D)                          | (D)     | 201     | 13.3                                    | 92.7    | 4.6     |
| Electronic components.....                                  | 367            | 4,869                 | 47         | 4,822   | (D)                          | (D)     | (D)     | 44.5                                    | 59.5    | (D)     |
| Other electrical equipment.....                             | 361-64,369     | (D)                   | (D)        | 2,401   | (D)                          | (D)     | 197     | 5.3                                     | 0.0     | 5.9     |
| Transportation equipment.....                               | 37             | 25,833                | 9,225 (S)  | 16,607  | 3,509                        | 1,763   | 1,746   | 10.7                                    | 14.4    | 8.5     |
| Motor vehicles and motor vehicles equipment.....            | 371            | (D)                   | (D)        | 13,673  | (D)                          | (D)     | (D)     | 0.5                                     | 0.0     | 0.6     |
| Other transportation equipment.....                         | 373-75,379     | (D)                   | (D)        | 82      | (D)                          | (D)     | (D)     | 48.4                                    | 51.1    | (D)     |
| Aircraft and missiles.....                                  | 372,376        | 10,682                | 7,830 (S)  | 2,852   | 3,153                        | 1,628   | 1,525   | 19.4                                    | 15.5    | 26.7    |
| Professional and scientific instruments.....                | 38             | (D)                   | (D)        | 5,834   | (D)                          | (D)     | 702     | (D)                                     | (D)     | 8.6     |
| Scientific and mechanical measuring instruments...          | 381-82         | (D)                   | (D)        | 2,089   | (D)                          | (D)     | 564     | 30.9                                    | 42.7    | 17.2    |
| Optical, surgical, photographic, and other instruments..... | 384-87         | (D)                   | (D)        | 3,745   | (D)                          | (D)     | 138     | 2.8                                     | 3.6     | 2.8     |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39       | 1,650                 | 79         | 1,571   | (D)                          | (D)     | 145     | 5.1                                     | 0.9     | 6.0     |

See explanatory information and SOURCE at end of table.

**Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1996**

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| Industry and size of company   | SIC code                        | Development           |           |         | Expenditures not distributed |         |         | Percent of expenditures not distributed |         |         |
|--|---------------------------------|-----------------------|-----------|---------|------------------------------|---------|---------|---|---------|---------|
|  |                                 | Total                 | Federal   | Company | Total                        | Federal | Company | Total                                   | Federal | Company |
|  |                                 | [Dollars in millions] |           |         |                              |         |         | [Percent]                               |         |         |
| <b>Distribution by industry:</b>   |                                 |                       |           |         |                              |         |         |   |         |         |
| Nonmanufacturing .....   |                                 | 22,245                | 1,679 (S) | 20,566  | 1,414                        | 418 (S) | 996     | 4.3                                     | 11.5    | 3.4     |
| Transportation and utilities.....  | 40-41,44-49                     | 3,560                 | 164       | 3,395   | (D)                          | (D)     | 78      | (D)                                     | (D)     | 1.7     |
| Communications.....  | 48                              | (D)                   | (D)       | 3,038   | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Telephone communications.....  | 481                             | (D)                   | (D)       | 2,982   | 0                            | 0       | 0       | 0.0                                     | 0.0     | 0.0     |
| Other communications.....  | 482-484,489                     | (D)                   | (D)       | 55      | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Electric, gas, and sanitary services.....  | 49                              | (D)                   | (D)       | 190     | 34                           | 0       | 34      | 9.7                                     | 0.0     | 10.9    |
| Other transportation and utilities.....  | 40-42,44-47                     | 163                   | 0         | 163     | 58                           | (D)     | (D)     | (D)                                     | 100.0   | (D)     |
| Trade.....   | 50-59                           | (D)                   | (D)       | 4,262   | 223                          | 0       | 223     | 3.5                                     | 0.0     | 3.5     |
| Finance, insurance, and real estate.....   | 60-65,67                        | 1,171                 | 0         | 1,171   | (D)                          | (D)     | (D)     | 0.5                                     | 100.0   | (D)     |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 12,417                | 1,458 (S) | 10,959  | 1,035 (S)                    | 348 (S) | 687 (S) | 5.4                                     | 11.2    | 4.3     |
| Business services.....   | 73                              | 7,993                 | 114       | 7,879   | 770 (S)                      | 148     | 623 (S) | 7.2                                     | 41.0    | 6.1     |
| Computer and data processing services.....   | 737                             | (D)                   | (D)       | 7,706   | (D)                          | 148     | (D)     | 7.3                                     | (D)     | (D)     |
| Other business services.....   | 731-736,738                     | (D)                   | (D)       | 173     | (D)                          | 0       | (D)     | 3.3                                     | 0.0     | (D)     |
| Health services.....   | 80                              | (D)                   | (D)       | 431 (S) | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | (D)                   | (D)       | (D)     | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Other health services.....   | 802-805,808-809                 | (D)                   | 0         | (D)     | 0                            | 0       | 0       | 0.0                                     | 0.0     | 0.0     |
| Engineering and management services.....   | 87                              | 3,738                 | 1,340 (S) | 2,397   | 264 (S)                      | 201 (S) | 64      | 3.6                                     | 7.3     | 1.4     |
| Engineering, architectural, and surveying.....                                     | 871                             | 913                   | 530       | 384     | (D)                          | (D)     | (D)     | (D)                                     | (D)     | (D)     |
| Research, development, and testing.....  | 873                             | 2,725                 | 810 (S)   | 1,915   | 225 (S)                      | 181 (S) | 45      | 4.1                                     | 10.6    | 1.2     |
| Other engineering and management services....                                      | 872,874                         | 98                    | 1         | 97      | (D)                          | (D)     | (D)     | (D)                                     | (D)     | (D)     |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | (D)                   | (D)       | 251     | (D)                          | 0       | (D)     | (D)                                     | 0.0     | (D)     |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | (D)                   | (D)       | 778     | (D)                          | (D)     | (D)     | 4.0                                     | 18.5    | (D)     |

See explanatory information and SOURCE at end of table.

**Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1996**

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| Industry and size of company                              | SIC code | Development           |            |         | Expenditures not distributed |         |         | Percent of expenditures not distributed |         |         |
|---|----------|-----------------------|------------|---------|------------------------------|---------|---------|---|---------|---------|
|   |          | Total                 | Federal    | Company | Total                        | Federal | Company | Total                                   | Federal | Company |
|   |          | [Dollars in millions] |            |         |                              |         |         | [Percent]                               |         |         |
| Distribution by size of company:<br>[Number of employees] |          |                       |            |         |                              |         |         |   |         |         |
| Total.....  |          | 91,852                | 14,420 (S) | 77,434  | 21,418                       | 5,106   | 16,311  | 14.8                                    | 21.6    | 13.5    |
| Fewer than 500.....                                       |          | 11,922                | 726        | 11,197  | 988                          | 185     | 802     | 4.9                                     | 8.0     | 4.5     |
| 500 to 999.....   |          | 2,603                 | 123        | 2,480   | (D)                          | (D)     | 415 (S) | (D)                                     | (D)     | 9.4     |
| 1,000 to 4,999.....                                       |          | 11,754                | 250        | 11,504  | 1,567                        | 125 (S) | 1,442   | 8.6                                     | 24.4    | 8.1     |
| 5,000 to 9,999.....                                       |          | 8,171                 | 289        | 7,881   | (D)                          | (D)     | 842     | (D)                                     | (D)     | 7.6     |
| 10,000 to 24,999.....                                     |          | 11,645                | 665 (S)    | 10,980  | 3,770                        | 300     | 3,470   | 18.7                                    | 29.1    | 18.1    |
| 25,000 or more.....                                       |          | 45,758                | 12,368 (S) | 33,392  | 13,805                       | 4,464   | 9,341   | 19.8                                    | 23.3    | 18.4    |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

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KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.  
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

**Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1997**

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| Industry and size of company                                | SIC code       | Total                 |         |         | Basic research |         |         | Applied research |         |         |
|---|----------------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|
|   |                | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company |
|   |                | [Dollars in millions] |         |         |                |         |         |                  |         |         |
| All Industries.....   |                | 157,539               | 23,928  | 133,611 | 8,623          | 1,173   | 7,450   | 25,597           | 1,822   | 23,775  |
| Distribution by industry:                                   |                |                       |         |         |                |         |         |                  |         |         |
| Manufacturing.....  |                | 121,025               | 19,823  | 101,202 | (D)            | (D)     | 4,926   | (D)              | (D)     | 17,046  |
| Food, kindred, and tobacco products .....                   | 20,21          | 1,787                 | 0       | 1,787   | 115            | 0       | 115     | 415              | 0       | 415     |
| Textiles and apparel.....                                   | 22,23          | (D)                   | (D)     | 476     | 37             | 0       | 37      | 31               | 0       | 31      |
| Lumber, wood products, and furniture.....                   | 24,25          | 348                   | 0       | 348     | (D)            | 0       | (D)     | 35               | 0       | 35      |
| Paper and allied products.....                              | 26             | (D)                   | (D)     | 1,456   | 82             | 0       | 82      | (D)              | (D)     | 104     |
| Chemicals and allied products.....                          | 28             | (D)                   | (D)     | 18,628  | (D)            | (D)     | 2,303   | (D)              | (D)     | 4,346   |
| Industrial chemicals.....                                   | 281-82,286     | (D)                   | (D)     | 4,970   | (D)            | (D)     | 614     | (D)              | (D)     | 1,238   |
| Drugs and medicines.....                                    | 283            | 11,589                | 3 (S)   | 11,586  | (D)            | (D)     | 1,609   | 2,529            | 0       | 2,529   |
| Other chemicals.....  | 284-85,287-89  | (D)                   | (D)     | 2,072   | 80             | 0       | 80      | (D)              | (D)     | 578     |
| Petroleum refining and extraction.....                      | 13,29          | (D)                   | (D)     | 1,612   | (D)            | 0       | (D)     | (D)              | (D)     | 462     |
| Rubber products.....  | 30             | (D)                   | (D)     | 1,372   | 53             | 0       | 53      | (D)              | (D)     | 186     |
| Stone, clay, and glass products.....                        | 32             | 608                   | 2       | 606     | (D)            | (D)     | (D)     | (D)              | (D)     | 193     |
| Primary metals.....   | 33             | 988                   | 221     | 767     | (D)            | (D)     | 29      | (D)              | (D)     | 129     |
| Ferrous metals and products.....                            | 331-32,3398-99 | (D)                   | (D)     | 414     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Nonferrous metals and products.....                         | 333-36         | (D)                   | (D)     | 353     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     |
| Fabricated metal products.....                              | 34             | 1,798                 | 129     | 1,669   | (D)            | (D)     | 81      | 309              | 84      | 225     |
| Machinery.....  | 35             | 18,499                | 106     | 18,393  | (D)            | (D)     | 459     | (D)              | (D)     | 3,334   |
| Office, computing, and accounting machines.....             | 357            | 12,840                | 53      | 12,787  | (D)            | (D)     | 149     | (D)              | (D)     | 2,587   |
| Other machinery, except electrical.....                     | 351-56,358-59  | 5,659                 | 53      | 5,606   | 310            | 0       | 310     | (D)              | (D)     | 746     |
| Electrical equipment.....                                   | 36             | 24,585                | 1,839   | 22,747  | 655            | 17 (S)  | 638     | 4,188            | 119     | 4,069   |
| Radio and TV receiving equipment.....                       | 365            | (D)                   | (D)     | 152     | 26             | 0       | 26      | (D)              | (D)     | (D)     |
| Communication equipment.....                                | 366            | (D)                   | (D)     | 7,377   | (D)            | (D)     | 145     | 1,002            | (D)     | (D)     |
| Electronic components.....                                  | 367            | (D)                   | (D)     | 10,786  | 211            | 0       | 211     | 2,294            | 34 (S)  | 2,260   |
| Other electrical equipment.....                             | 361-64,369     | 4,909                 | 477     | 4,432   | (D)            | (D)     | 255     | (D)              | (D)     | 795     |
| Transportation equipment.....                               | 37             | 31,993                | 12,251  | 19,742  | (D)            | (D)     | 132     | (D)              | (D)     | 2,019   |
| Motor vehicles and motor vehicles equipment.....            | 371            | (D)                   | (D)     | 13,758  | 103            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Other transportation equipment.....                         | 373-75,379     | (D)                   | (D)     | 307     | (D)            | 0       | (D)     | (D)              | 0       | (D)     |
| Aircraft and missiles.....                                  | 372,376        | 16,296                | 10,619  | 5,677   | (D)            | (D)     | 15      | (D)              | (D)     | 1,260   |
| Professional and scientific instruments.....                | 38             | 13,458                | 4,499   | 8,958   | (D)            | (D)     | 735     | 1,077            | 66      | 1,011   |
| Scientific and mechanical measuring instruments...          | 381-82         | 8,135                 | 4,416   | 3,719   | (D)            | (D)     | 262     | 357              | 24 (S)  | 333     |
| Optical, surgical, photographic, and other instruments..... | 384-87         | 5,323                 | 84      | 5,240   | (D)            | (D)     | 473     | 720              | 42      | 678     |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39       | 2,798                 | 156     | 2,642   | (D)            | (D)     | 123     | 508              | 20      | 488     |

See explanatory information and SOURCE at end of table.

**Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1997**

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| Industry and size of company   | SIC code                        | Total                 |           |         | Basic research |         |         | Applied research |         |         |
|--|---------------------------------|-----------------------|-----------|---------|----------------|---------|---------|------------------|---------|---------|
|  |                                 | Total                 | Federal   | Company | Total          | Federal | Company | Total            | Federal | Company |
|  |                                 | [Dollars in millions] |           |         |                |         |         |                  |         |         |
| Distribution by industry:  |                                 |                       |           |         |                |         |         |                  |         |         |
| Nonmanufacturing .....   |                                 | 36,514                | 4,105     | 32,409  | (D)            | (D)     | 2,525   | (D)              | (D)     | 6,731   |
| Transportation and utilities.....  | 40-42,44-49                     | 3,013                 | 200       | 2,812   | 161            | 0       | 161     | (D)              | (D)     | (D)     |
| Communications.....  | 48                              | (D)                   | (D)       | 1,884   | (D)            | 0       | (D)     | (D)              | 0       | (D)     |
| Telephone communications.....  | 481                             | (D)                   | (D)       | 1,826   | (D)            | 0       | (D)     | (D)              | 0       | (D)     |
| Other communications.....  | 482-484,489                     | 58                    | 0         | 58      | (D)            | 0       | (D)     | (D)              | 0       | (D)     |
| Electric, gas, and sanitary services.....  | 49                              | (D)                   | (D)       | 258     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     |
| Other transportation and utilities.....  | 40-42,44-47                     | (D)                   | (D)       | 670     | (D)            | 0       | (D)     | (D)              | 0       | (D)     |
| Trade.....   | 50-59                           | (D)                   | (D)       | 7,961   | (D)            | (D)     | 933     | (D)              | (D)     | 1,995   |
| Finance, insurance, and real estate.....   | 60-65,67                        | (D)                   | (D)       | 1,500   | 13             | 0       | 13      | (D)              | (D)     | (D)     |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 22,400                | 3,805     | 18,594  | (D)            | (D)     | 1,322   | 4,285            | 771     | 3,514   |
| Business services.....   | 73                              | 11,960                | 400       | 11,560  | (D)            | (D)     | 603     | (D)              | (D)     | 1,229   |
| Computer and data processing services.....   | 737                             | 11,706                | 389       | 11,318  | (D)            | 15      | (D)     | 1,331            | 131     | 1,200   |
| Other business services.....   | 731-736,738                     | 254                   | 11        | 242     | (D)            | (D)     | (D)     | (D)              | (D)     | 29      |
| Health services.....   | 80                              | (D)                   | (D)       | 679     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | (D)                   | 4         | (D)     | 15             | 0       | 15      | (D)              | 4       | (D)     |
| Other health services.....   | 802-805,808-809                 | 49                    | (D)       | (D)     | (D)            | 0       | (D)     | (D)              | (D)     | (D)     |
| Engineering and management services.....   | 87                              | 9,290                 | 3,381 (S) | 5,909   | (D)            | (D)     | 695     | 2,621            | 628     | 1,993   |
| Engineering, architectural, and surveying.....                                     | 871                             | 2,039                 | 1,258     | 781     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Research, development, and testing.....  | 873                             | (D)                   | (D)       | 4,782   | (D)            | (D)     | 624     | 1,863            | 247     | 1,616   |
| Other engineering and management services....                                      | 872,874                         | (D)                   | (D)       | 347     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | (D)                   | (D)       | 446     | (D)            | (D)     | (D)     | (D)              | (D)     | (D)     |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | 1,618                 | 77        | 1,541   | 108            | 12      | 96      | 315              | 51      | 264     |

See explanatory information and SOURCE at end of table.

**Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1997**

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| Industry and size of company                              | SIC code | Total                 |         |         | Basic research |         |         | Applied research |         |         |
|---|----------|-----------------------|---------|---------|----------------|---------|---------|------------------|---------|---------|
|   |          | Total                 | Federal | Company | Total          | Federal | Company | Total            | Federal | Company |
|   |          | [Dollars in millions] |         |         |                |         |         |                  |         |         |
| Distribution by size of company:<br>[Number of employees] |          |                       |         |         |                |         |         |                  |         |         |
| Total.....  |          | 157,539               | 23,928  | 133,611 | 8,623          | 1,173   | 7,450   | 25,597           | 1,822   | 23,775  |
| Fewer than 500.....                                       |          | 24,063                | 2,209   | 21,854  | 2,438          | 337     | 2,101   | 6,144            | 704     | 5,440   |
| 500 to 999.....   |          | 4,966                 | 376     | 4,590   | (D)            | (D)     | 372     | 1,116            | 98      | 1,018   |
| 1,000 to 4,999.....                                       |          | 19,590                | 540     | 19,049  | 1,756          | 37 (S)  | 1,719   | 3,682            | 98      | 3,584   |
| 5,000 to 9,999.....                                       |          | 14,266                | 612     | 13,655  | (D)            | (D)     | 421     | (D)              | (D)     | 2,792   |
| 10,000 to 24,999.....                                     |          | 21,510                | 913     | 20,597  | (D)            | (D)     | 2,039   | (D)              | (D)     | 4,474   |
| 25,000 or more.....                                       |          | 73,144                | 19,277  | 53,866  | (D)            | (D)     | 798     | (D)              | (D)     | 6,469   |

See explanatory information and SOURCE at end of table.

**Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1997**

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| Industry and size of company                                | SIC code       | Development           |         |         | Expenditures not distributed |           |         | Percent of expenditures not distributed |         |         |
|---|----------------|-----------------------|---------|---------|------------------------------|-----------|---------|---|---------|---------|
|   |                | Total                 | Federal | Company | Total                        | Federal   | Company | Total                                   | Federal | Company |
|   |                | [Dollars in millions] |         |         |                              |           |         |   |         |         |
| All Industries.....   |                | 95,542                | 13,795  | 81,747  | 27,777                       | 7,139     | 20,638  | 18                                      | 30      | 15      |
| Distribution by industry:                                   |                |                       |         |         |                              |           |         |   |         |         |
| Manufacturing.....  |                | 72,145                | 12,250  | 59,895  | (D)                          | (D)       | 19,336  | (D)                                     | (D)     | 19      |
| Food, kindred, and tobacco products .....                   | 20,21          | 1,076                 | 0       | 1,076   | 180                          | 0         | 180     | 10                                      | 0       | 10      |
| Textiles and apparel.....                                   | 22,23          | (D)                   | (D)     | 364 (S) | 45 (S)                       | 0         | 45 (S)  | (D)                                     | (D)     | 9       |
| Lumber, wood products, and furniture.....                   | 24,25          | 275                   | 0       | 275     | (D)                          | 0         | (D)     | (D)                                     | (D)     | (D)     |
| Paper and allied products.....                              | 26             | (D)                   | (D)     | 307     | (D)                          | (D)       | 962 (S) | 67                                      | 100     | 66      |
| Chemicals and allied products.....                          | 28             | (D)                   | (D)     | 9,151   | (D)                          | (D)       | 2,830   | 15                                      | 0       | 15      |
| Industrial chemicals.....                                   | 281-82,286     | (D)                   | (D)     | 2,271   | (D)                          | (D)       | 847     | 15                                      | 0       | 17      |
| Drugs and medicines.....                                    | 283            | (D)                   | (D)     | 5,711   | (D)                          | (D)       | 1,737   | (D)                                     | (D)     | 15      |
| Other chemicals.....  | 284-85,287-89  | (D)                   | (D)     | 1,167   | 246                          | 0         | 246     | (D)                                     | (D)     | 12      |
| Petroleum refining and extraction.....                      | 13,29          | (D)                   | (D)     | 603     | (D)                          | 0         | (D)     | 31                                      | (D)     | (D)     |
| Rubber products.....  | 30             | (D)                   | (D)     | 848     | 284                          | 0         | 284     | (D)                                     | (D)     | 21      |
| Stone, clay, and glass products.....                        | 32             | (D)                   | (D)     | 309     | (D)                          | 0         | (D)     | (D)                                     | 0       | (D)     |
| Primary metals.....   | 33             | 419                   | 28 (S)  | 391     | (D)                          | (D)       | 219     | (D)                                     | (D)     | 28      |
| Ferrous metals and products.....                            | 331-32,3398-99 | 294                   | 28 (S)  | 266     | (D)                          | (D)       | (D)     | 42                                      | 87      | (D)     |
| Nonferrous metals and products.....                         | 333-36         | 125                   | 1       | 124     | (D)                          | (D)       | (D)     | 40                                      | 67      | (D)     |
| Fabricated metal products.....                              | 34             | (D)                   | (D)     | 775     | (D)                          | (D)       | 589     | (D)                                     | (D)     | 35      |
| Machinery.....  | 35             | 9,804                 | 61      | 9,743   | (D)                          | (D)       | 4,857   | (D)                                     | (D)     | 26      |
| Office, computing, and accounting machines.....             | 357            | (D)                   | (D)     | 6,089   | 3,963                        | 0         | 3,963   | 31                                      | 0       | 31      |
| Other machinery, except electrical.....                     | 351-56,358-59  | (D)                   | (D)     | 3,656   | (D)                          | (D)       | 895     | (D)                                     | (D)     | 16      |
| Electrical equipment.....                                   | 36             | 12,175                | 447     | 11,728  | 7,567                        | 1,256     | 6,311   | 31                                      | 68      | 28      |
| Radio and TV receiving equipment.....                       | 365            | (D)                   | (D)     | 112     | (D)                          | 0         | (D)     | 1                                       | (D)     | (D)     |
| Communication equipment.....                                | 366            | 6,141                 | 163     | 5,978   | 763                          | (D)       | (D)     | (D)                                     | 75      | (D)     |
| Electronic components.....                                  | 367            | (D)                   | (D)     | 3,127   | (D)                          | (D)       | 5,188   | 51                                      | 93      | 48      |
| Other electrical equipment.....                             | 361-64,369     | 2,778                 | 266     | 2,512   | (D)                          | (D)       | 871     | (D)                                     | (D)     | 20      |
| Transportation equipment.....                               | 37             | 25,517                | 8,880   | 16,637  | 2,978 (S)                    | 2,025 (S) | 953     | 9                                       | 17      | 5       |
| Motor vehicles and motor vehicles equipment.....            | 371            | (D)                   | (D)     | 12,941  | 36                           | (D)       | (D)     | (D)                                     | 1       | (D)     |
| Other transportation equipment.....                         | 373-75,379     | (D)                   | (D)     | 165     | (D)                          | (D)       | (D)     | 35                                      | 50      | (D)     |
| Aircraft and missiles.....                                  | 372,376        | 11,055                | 7,524   | 3,531   | (D)                          | (D)       | 869     | (D)                                     | (D)     | 15      |
| Professional and scientific instruments.....                | 38             | (D)                   | (D)     | 5,858   | (D)                          | (D)       | 1,354   | (D)                                     | (D)     | 15      |
| Scientific and mechanical measuring instruments...          | 381-82         | (D)                   | (D)     | 2,382   | (D)                          | (D)       | 740     | (D)                                     | (D)     | 20      |
| Optical, surgical, photographic, and other instruments..... | 384-87         | (D)                   | (D)     | 3,474   | 614                          | 0         | 614     | 12                                      | 0       | 12      |
| Other manufacturing industries <sup>1</sup> .....           | 27,31,39       | 1,961                 | 130     | 1,831   | (D)                          | (D)       | 199     | (D)                                     | (D)     | 8       |

See explanatory information and SOURCE at end of table.

**Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1997**

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| Industry and size of company   | SIC code                        | Development           |         |         | Expenditures not distributed |         |         | Percent of expenditures not distributed |         |         |
|--|---------------------------------|-----------------------|---------|---------|------------------------------|---------|---------|---|---------|---------|
|  |                                 | Total                 | Federal | Company | Total                        | Federal | Company | Total                                   | Federal | Company |
|  |                                 | [Dollars in millions] |         |         |                              |         |         | [Percent]                               |         |         |
| <b>Distribution by industry:</b>   |                                 |                       |         |         |                              |         |         |   |         |         |
| Nonmanufacturing .....   |                                 | 23,396                | 1,545   | 21,851  | (D)                          | (D)     | 1,303   | (D)                                     | (D)     | 4       |
| Transportation and utilities.....  | 40-41,44-49                     | (D)                   | (D)     | 1,541   | (D)                          | (D)     | (D)     | (D)                                     | (D)     | (D)     |
| Communications.....  | 48                              | (D)                   | (D)     | 1,174   | 0                            | 0       | 0       | (D)                                     | (D)     | 0       |
| Telephone communications.....  | 481                             | (D)                   | (D)     | 1,144   | 0                            | 0       | 0       | (D)                                     | (D)     | 0       |
| Other communications.....  | 482-484,489                     | 30                    | 0       | 30      | 0                            | 0       | 0       | 0                                       | 0       | 0       |
| Electric, gas, and sanitary services.....  | 49                              | (D)                   | (D)     | 151     | (D)                          | (D)     | 30 (S)  | 12                                      | 18      | 12      |
| Other transportation and utilities.....  | 40-42,44-47                     | (D)                   | (D)     | 216     | (D)                          | (D)     | (D)     | 26                                      | 96      | (D)     |
| Trade.....   | 50-59                           | (D)                   | (D)     | 4,951   | 82                           | 0       | 82      | (D)                                     | (D)     | 1       |
| Finance, insurance, and real estate.....   | 60-65,67                        | 1,431                 | 0       | 1,431   | (D)                          | 0       | (D)     | 1                                       | (D)     | (D)     |
| Services.....  | 701,72,73,75-81,<br>83,84,87,89 | 14,329                | 1,334   | 12,995  | (D)                          | (D)     | 763     | (D)                                     | (D)     | 4       |
| Business services.....   | 73                              | 9,362                 | 193     | 9,169   | 620                          | 62 (S)  | 558     | 5                                       | 15      | 5       |
| Computer and data processing services.....   | 737                             | 9,154                 | 182     | 8,972   | (D)                          | 62 (S)  | (D)     | (D)                                     | 16      | (D)     |
| Other business services.....   | 731-736,738                     | 209                   | 11      | 198     | (D)                          | 0       | (D)     | (D)                                     | 0       | (D)     |
| Health services.....   | 80                              | (D)                   | 0       | (D)     | 10                           | 0       | 10      | (D)                                     | (D)     | 1       |
| Offices and clinics of medical doctors,<br>hospitals, medical and dental labs..... | 801,806,807                     | (D)                   | 0       | (D)     | 0                            | 0       | 0       | (D)                                     | 0       | (D)     |
| Other health services.....   | 802-805,808-809                 | 9                     | 0       | 9       | 10                           | 0       | 10      | 20                                      | (D)     | (D)     |
| Engineering and management services.....   | 87                              | 4,157                 | 1,130   | 3,027   | (D)                          | (D)     | 195     | (D)                                     | (D)     | 3       |
| Engineering, architectural, and surveying.....                                     | 871                             | 1,219                 | 702     | 517     | (D)                          | 5       | (D)     | (D)                                     | 0       | (D)     |
| Research, development, and testing.....  | 873                             | (D)                   | (D)     | 2,362   | (D)                          | (D)     | 180     | 21                                      | 60      | 4       |
| Other engineering and management services....                                      | 872,874                         | (D)                   | (D)     | 148     | (D)                          | 0       | (D)     | 4                                       | (D)     | (D)     |
| Other services.....  | 701,72,75-79,81,<br>83,84,89    | (D)                   | 11      | (D)     | 0                            | 0       | 0       | (D)                                     | (D)     | 0       |
| Other nonmanufacturing industries <sup>1</sup> .....                               | 07-12,14,15,<br>161-162,17      | 947                   | 14      | 933     | 249                          | 0       | 249     | 15                                      | 0       | 16      |

See explanatory information and SOURCE at end of table.

**Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, size of company, and source of funds: 1997**

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| Industry and size of company                              | SIC code | Development           |         |         | Expenditures not distributed |         |         | Percent of expenditures not distributed |         |         |
|---|----------|-----------------------|---------|---------|------------------------------|---------|---------|---|---------|---------|
|   |          | Total                 | Federal | Company | Total                        | Federal | Company | Total                                   | Federal | Company |
|   |          | [Dollars in millions] |         |         |                              |         |         | [Percent]                               |         |         |
| Distribution by size of company:<br>[Number of employees] |          |                       |         |         |                              |         |         |   |         |         |
| Total.....  |          | 95,542                | 13,795  | 81,747  | 27,777                       | 7,139   | 20,638  | 18                                      | 30      | 15      |
| Fewer than 500.....                                       |          | 14,281                | 1,124   | 13,157  | 1,200                        | 45      | 1,155   | 5                                       | 2       | 5       |
| 500 to 999.....   |          | 3,016                 | 194     | 2,822   | (D)                          | (D)     | 378 (S) | (D)                                     | (D)     | 8       |
| 1,000 to 4,999.....                                       |          | 12,449                | 352     | 12,097  | 1,703                        | 53      | 1,650   | 9                                       | 10      | 9       |
| 5,000 to 9,999.....                                       |          | 9,011                 | 312     | 8,699   | 1,832                        | 89      | 1,743   | 13                                      | 15      | 13      |
| 10,000 to 24,999.....                                     |          | 11,642                | 526 (S) | 11,116  | (D)                          | (D)     | 2,969   | (D)                                     | (D)     | 14      |
| 25,000 or more.....                                       |          | 45,143                | 11,287  | 33,856  | 19,344                       | 6,601   | 12,743  | 26                                      | 34      | 24      |

<sup>1</sup> Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

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**KEY:** (D) = Data have been withheld to avoid disclosing operations of individual companies.  
(S) = Indicates imputation of more than 50 percent.

**SOURCE:** National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1997

# COMPARABILITY OF STATISTICS

This section summarizes survey procedures and practices that may have affected the comparability of statistics produced from the Survey of Industrial Research and Development over time and with other statistical series.<sup>10</sup>

## REVISIONS TO HISTORICAL AND IMMEDIATE PRIOR YEAR STATISTICS

Revisions to historical statistics usually have been made because of changes in the industry classification of companies caused, in turn, by changes in payroll composition detected when a new sample was drawn. Various methodologies have been adopted over the years to revise, or backcast, the data when revisions to historical statistics have become necessary. Documented revisions to the historical statistics from post-1967 surveys are summarized in NSF (1994). Detailed descriptions of the specific revisions made to the statistics from pre-1967 surveys are scarce, but U.S. Bureau of the Census (1995) summarizes some of the major revisions.

Changes to reported data can come from three sources: respondents, analysts involved in survey and statistical processing, and the industry reclassification process. Prior to 1995, routine revisions were made to prior year statistics based on information from all three sources. Consequently, results from the current-year survey were used not only to develop current-year statistics, but also to revise immediate prior year statistics. Beginning with the 1995 survey, this practice was discontinued. The reasons for discontinuation of this practice were annual sampling, continual strengthening of sampling methodology, and improvements in data verification, processing, and nonresponse follow-up. Moreover, it is not clear that respondents or those who processed the survey results had any better information a year after the data were first reported. Thus, it was determined that routinely revising published survey statistics increased the potential for error and often confused users of the statistics. Revisions are now made to historical and immediate prior-year statistics only if egregious errors are discovered.

## YEAR-TO-YEAR CHANGES

Comparability from year to year may be affected by new sample design, annual sample selection, and industry shifts.

### SAMPLE DESIGN

By far the most profound influence on statistics from recent surveys occurred when the new sample design for the 1992 survey was introduced. Revisions to the 1991 statistics were dramatic (see *Research and Development in Industry: 1992* for a detailed discussion). While the allocation of the sample was changed somewhat, the sample designs used for the 1993–97 surveys were comparable to the 1992 sample design in terms of size and coverage.

### ANNUAL SAMPLE SELECTION

With the introduction of annual sampling in 1992, more year-to-year change has resulted than when survey panels were used. There are two reasons why this is so. First, changes in classification of companies not surveyed were not reflected in the year-to-year movement. Prior to annual sampling, a wedging operation—which was performed when a new sample was selected—was a means of adjusting the data series to account for the changes in classification that occurred in the frame (see the discussion on wedging later). Second, yearly correlation of R&D data is lost when independent samples are drawn each year.

### INDUSTRY SHIFTS

The industry classification of companies is redefined each year with the creation of the sampling frame. By redefining the frame, the sample reflects current distributions of companies by size and industry. A company may move from one industry to another due to either changes in its payroll composition, which is used to determine the industry classification code (see previous discussion under “Frame Creation”); changes in the industry classification system itself; or changes in the way the industry classification code is assigned or revised during survey processing.

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<sup>10</sup> See also U.S. Bureau of the Census (1995).

A company's payroll composition can change because of the growth or decline of product or service lines, the merger of two or more companies, the acquisition of one company by another; divestitures; or the formation of conglomerates. Although an unlikely occurrence, a company's industry designation can be reclassified yearly with the introduction of annual sampling in 1992. The result is that a downward movement in R&D expenditures in one industry is balanced by an upward movement in another industry from one year to the next.

From time to time, the SIC coding system, which is used by most Federal agencies that publish industry statistics, is revised to reflect the changing composition of U.S. industry. For statistics developed for 1988–91 from the 1988–91 surveys, companies retained the industry classifications assigned for the 1987 sample. These classifications were based on the 1977 SIC system. The last major revision of the SIC system was in 1987. This new system has been used to classify companies in all of the post-1991 surveys.

The method used to classify firms during survey processing was revised slightly in 1992. Research has shown that the impact on individual industry estimates has been minor.<sup>11</sup> The current method used to classify firms was discussed previously under "Frame Creation." Methods used for past surveys are discussed in U.S. Bureau of the Census (1995).

## CAPTURING SMALL AND NONMANUFACTURING R&D PERFORMERS<sup>12</sup>

Before the 1992 survey, the sample of firms surveyed was selected at irregular intervals.<sup>13</sup> In intervening years, a panel of the largest firms known to perform R&D was surveyed. For example, a sample of about 14,000 firms was selected for the 1987 survey. For the 1988–91 studies, about 1,700 of these firms were resurveyed annually; the other firms did not receive questionnaires, and their R&D data were estimated. This sample design was adequate during the survey's early years because R&D performance was concentrated in relatively few

<sup>11</sup> The effects of recent changes in the way companies are classified during survey processing are discussed in detail in U.S. Bureau of the Census (1994e and 1994a).

<sup>12</sup> See also NSF (1994, 1995, and 1996a).

<sup>13</sup> Until 1967, samples were selected every 5 years. Subsequent samples were selected for 1971, 1976, 1981, and 1987.

manufacturing industries. However, as more and more firms began entering the R&D arena, the old sample design proved increasingly deficient because it did not capture births of new R&D-performing firms. The entry of fledgling R&D performers into the marketplace was completely missed during panel years. Additionally, beginning in the early 1970s, the need for more detailed R&D information for nonmanufacturers was recognized. At that time, the broad industry classifications "miscellaneous business services" and "miscellaneous services" were added to the list of industry groups for which statistics were published. By 1975, about 3 percent of total R&D was performed by firms in nonmanufacturing industries.

During the mid-1980s, there was evidence that a significant amount of R&D was being conducted by an increasing number of nonmanufacturing firms; again, the number of industries used to develop the statistics for nonmanufacturers was increased. Consequently, since 1987 the annual reports in this series have included separate R&D estimates for firms in the communication, utility, engineering, architectural, research, development, testing, computer programming, and data processing service industries; hospitals; and medical labs. Approximately 9 percent of the estimated industrial R&D performance during 1987 was undertaken by nonmanufacturing firms.

After the list of industries for which statistics were published was expanded, it became clear that the sample design itself should be changed to reflect the widening population of R&D performers among firms in the nonmanufacturing industries<sup>14</sup> and small firms in all industries so as to account better for births of R&D-

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<sup>14</sup> For the 1992 survey, 25 new nonmanufacturing industry and industry groups were added to the sample frame: agricultural services (SIC 07); fishing, hunting, and trapping (09); wholesale trade—nondurables (51); stationery and office supply stores (5112); industrial and personal service paper (5113); groceries and related products (514); chemicals and allied products (516); miscellaneous nondurable goods (519); home furniture, furnishings, and equipment stores (57); radio, TV, consumer electronics, and music stores (573); eating and drinking places (581); miscellaneous retail (59); nonstore retailers (596); real estate (65); holding and other investment offices (67); hotels, rooming houses, camps, and other lodging places (70); automotive repair, services, and parking (75); miscellaneous repair services (76); amusement and recreation services (79); health services (80); offices and clinics of medical doctors (801); offices and clinics of other health practitioners (804); miscellaneous health and allied services not elsewhere classified (809); engineering, accounting, research, management, and related services (87); and management and public relations services (874).

industries so as to account better for births of R&D-performing firms and to produce more reliable statistics. Beginning with the 1992 survey, NSF decided to (1) draw new samples with broader coverage annually, and (2) increase the sample size to approximately 25,000 firms.<sup>15</sup> As a result of the sample redesign, for 1992 the reported nonmanufacturing share was and continues to be estimated at approximately 25 percent of total R&D.<sup>16</sup>

## TIME-SERIES ANALYSES

As discussed earlier, the statistics resulting from this survey are better indicators of changes in, rather than absolute levels of, R&D spending and personnel. Nevertheless, the statistics are often taken to be a continuous time series prepared using the same collection, processing, and tabulation methods. Such uniformity has not been the case. Since the survey was first fielded, improvements have been made to increase the reliability of the statistics and to make the survey results more useful. To that end, past practices have been changed and new procedures instituted. Preservation of the comparability of the statistics has, however, been an important consideration in making these improvements. Nonetheless, changes to survey definitions, the industry classification system, and the procedure used to assign industry codes to multi-establishment companies have had some, though not substantial, effects on the comparability of statistics.<sup>17</sup>

The aspect of the survey that had the greatest effect on comparability was the selection of samples at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987, and 1992) and the use of a subset or panel of the last sample drawn to develop statistics for intervening years. As discussed earlier, this practice introduced cyclical deterioration of the statistics. As compensation for this deterioration, periodic revisions were made to the statistics produced from the panels surveyed between sample years. Early in the survey's history, various methods were used to make these revisions.<sup>18</sup> After 1976 and until the 1992 advent of annual sampling, a linking procedure called

wedging was used.<sup>19</sup> In wedging, the 2 sample years on each end of a series of estimates served as benchmarks in the algorithms used to adjust the estimates for the intervening years.

For a full discussion of the mathematical algorithm used for the wedging process that linked statistics from the 1992 survey with those from the 1987 survey, see U.S. Bureau of the Census (1994g). In general, wedging

*takes full advantage of the fact that in the first year of a new panel [when a new sample is selected], both current-year and prior-year estimates are derived. Thus, two independent estimates exist for the prior year. The estimates from the new panel are treated as superior primarily because the new panel is based on updated classifications [the industry classifications in the prior panel are frozen] and is more fully representative of the current universe (the prior panel suffers from panel deterioration, especially a lack of birth updating). The limitations in the prior panel caused by these factors are naturally assumed to increase with time, so that in the revised series, we desire a gradual increase in the level or revision over time which culminates in the real difference observed between the two independent sample estimates of the prior year. At the same time, we desire that the annual movement of the original series be preserved to the degree possible in the revised series (U.S. Bureau of the Census, 1994).*

To that end, the wedging algorithm does not change estimates from sample years and adjusts estimates from panel years, recognizing that deterioration of the panel is progressive over time. One of the primary reasons for deciding to select a new sample annually rather than at irregular intervals was to avoid applying global revision processes such as wedging. Consequently, the 1992 survey was intended to be the last one affected by the wedging procedure.

## COMPARISONS TO OTHER STATISTICAL SERIES

NSF collects data on federally financed R&D from both Federal funding agencies—using the Survey of Federal Funds for Research and Development—and

<sup>15</sup> Annual sampling also remedies the cyclical deterioration of the statistics that results from changes in a company's payroll composition because of product line and corporate structural changes.

<sup>16</sup> See also NSF (1997a and 1998a).

<sup>17</sup> For discussions of each of these changes, see U.S. Bureau of the Census (1994g); for considerations of comparability, see U.S. Bureau of the Census (1994e and 1993).

<sup>18</sup> See U.S. Bureau of the Census (1995).

<sup>19</sup> The process was dubbed wedging because of the wedgelike area produced on a graph that compares originally reported statistics with the revised statistics that result after linking.

performers of the work, industry, Federal labs, universities, and other nonprofit organizations—using the Survey of Industrial Research and Development and other surveys. As reported by Federal agencies, NSF publishes data on Federal R&D budget authority and outlays, in addition to Federal obligations. These terms are defined below:<sup>20</sup>

- *Budget authority* is the primary source of legal authorization to enter into financial obligations that will result in outlays. Budget authority most commonly is granted in the form of appropriations laws enacted by Congress with the approval of the president (NSF 1998b).
- *Obligations* represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated or when future payment of money is required.
- *Outlays* represent the amounts for checks issued and cash payments made during a given period, regardless of when the funds were appropriated or obligated.

National R&D expenditure totals in NSF's *National Patterns of R&D Resources* report series are primarily constructed with data reported by performers and include estimates of Federal R&D funding to these sectors. But until performer-reported survey data on Federal R&D expenditures are available from industry and academia, data collected from the Federal agency funders of R&D are used to project R&D performance. When survey data from the performers subsequently are tabulated, as they are in this report, these statistics replace the projections based on funder expectations. Historically, the two survey systems have tracked fairly closely. For example, in 1980, performers reported using \$29.5 billion in Federal R&D funding, and Federal agencies reported total R&D funding between \$29.2 billion in outlays and \$29.8 billion in obligations (NSF 1996b). In recent years, however, the two series have diverged considerably. The difference in the Federal R&D totals appears to be concentrated in funding of industry, primarily aircraft and missile firms, by the Department of Defense. Overall, industrial firms have reported significant declines in Federal R&D support since 1990 (see table A-1), while Federal agencies have reported level or slightly increased funding of industrial R&D (NSF 1996b). NSF is examining the causal factors behind these divergent trends.

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<sup>20</sup> See also NSF (1997b).

# SURVEY DEFINITIONS

## R&D FUNDS PER R&D SCIENTIST OR ENGINEER

All expenditures associated with the performance of industrial R&D (salaries, wages, and fringe benefits paid to R&D scientists and engineers; materials and supplies used for R&D; depreciation on capital equipment and facilities used for R&D; and any other R&D costs) divided by the number of R&D scientists and engineers employed. To obtain a per person expenditures on R&D for a given year, the total R&D expenditures of that year are divided by an approximation of the number of full-time-equivalent (FTE) scientists and engineers engaged in the performance of R&D for that year. For accuracy, this approximation is the mean of the numbers of such FTE R&D-performing scientists and engineers as reported in January for the year in question and the subsequent year. For example, the mean of the numbers of FTE R&D scientists and engineers in January 1996 and January 1997 is divided into total 1996 R&D expenditures for a total cost per R&D scientist or engineer in 1996.

## EMPLOYMENT, FTE R&D SCIENTISTS AND ENGINEERS

People employed by the company during the January following the survey year who are engaged in scientific or engineering work at a level that requires knowledge of engineering or of the physical, biological, mathematical, statistical, or computer sciences equivalent at least to that acquired through completion of a 4-year college program with a major in one of those fields. FTE employment is the number of scientists and engineers in the company who are assigned full time plus a prorated number of employees working part time on R&D.

## EMPLOYMENT, TOTAL

Number of people domestically employed by R&D-performing companies in all activities during the pay period that includes the 12th of March, the date most employers use when paying first quarter employment taxes to the Internal Revenue Service.

## FEDERALLY FUNDED R&D CENTERS (FFRDCs)

R&D-performing organizations administered by industrial, educational, or other institutions on a nonprofit basis, and exclusively or substantially financed by the Federal Government. R&D expenditures of industry-administered FFRDCs are included with the Federal R&D data of the industry classification of each of the administering firms. The industry-administered FFRDCs included in the 1997 survey are listed below.

### FFRDCs SUPPORTED BY THE DEPARTMENT OF ENERGY

Energy Technology Engineering Center,  
Rockwell International Corp.,  
Canoga Park, CA

Idaho National Engineering Laboratory,  
Lockheed Martin Corp.,  
Idaho Falls, ID

Oak Ridge National Laboratory,  
Lockheed Martin Corp.,  
Oak Ridge, TN

Sandia National Laboratories, Lockheed Martin Corp.,  
Albuquerque, NM

Savannah River Laboratory,  
Westinghouse Corp.,  
Aiken, SC

### FFRDC SUPPORTED BY THE DEPARTMENT OF HEALTH AND HUMAN SERVICES, NATIONAL INSTITUTES OF HEALTH

National Cancer Institute (NCI) Frederick Cancer Research Facility  
Science Applications International Corporation  
Advanced Bioscience Laboratories, Inc., Frederick, MD

## FUNDS FOR R&D, COMPANY AND OTHER

The cost of R&D actually performed within the company and funded by the company itself or by other non-federal sources, not including the cost of R&D supported by companies but contracted to outside organizations such as research institutions, universities and colleges, nonprofit organizations, or—to avoid double-counting—other companies.

## FUNDS FOR R&D, FEDERAL

Receipts for R&D performed by the company under Federal R&D contracts or subcontracts and R&D portions of Federal procurement contracts and subcontracts.

## FUNDS FOR R&D, TOTAL

Operating expenses incurred by a company in conducting R&D in its own laboratories or in other company-owned or -operated facilities. These expenses include wages and salaries; materials and supplies; property and other taxes; maintenance and repairs; depreciation; and an appropriate share of overhead, not including capital expenditures.

## INDUSTRIAL R&D

As used in this survey, R&D is the pursuit of a planned search for new knowledge or understanding of the subject under study. This search may have reference to a specific application (*basic research*); the acquisition of knowledge or understanding to meet a specific,

recognized need (*applied research*); or the application of existing knowledge or understanding toward the improvement of a present product or process (*development*). In industry, *basic research* is the pursuit of new scientific knowledge or understanding that does not have specific immediate commercial objectives, although it may be in fields of present or potential commercial interest; *applied research* is investigation toward discovering new scientific knowledge that has specific commercial objectives with respect to products, processes, or services; and *development* is the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes. The survey covers industrial R&D performed by people trained—either formally or by experience—in engineering or in the physical, biological, mathematical, statistical, or computer sciences and employed by a publicly or privately owned firm engaged in for-profit activity in the United States. Specifically excluded from the survey are quality control, routine product testing, market research, sales promotion, sales service, and other nontechnological activities; routine technical services; and research in the social sciences or psychology.

## NET SALES AND RECEIPTS

Dollar values for goods sold or services rendered by R&D-performing companies to customers outside the company—including the Federal Government—less such items as returns, allowances, freight, charges, and excise taxes. Domestic intracompany transfers and sales by foreign subsidiaries are excluded, but transfers to foreign subsidiaries and export sales to foreign companies are included.

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## **SECTION C. SURVEY DOCUMENTS**

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OFFICE OF THE  
DIRECTOR

NATIONAL SCIENCE FOUNDATION  
4201 WILSON BOULEVARD  
ARLINGTON, VIRGINIA 22230

FROM THE DIRECTOR  
NATIONAL SCIENCE FOUNDATION

The National Science Foundation requests your company's participation in the 1997 Survey of Industrial Research and Development that the Bureau of the Census is conducting for us. This annual survey is the only source of detailed information on U.S. industry's research and development (R&D) performance.

Your company's participation is vital to the accuracy of the resulting information. Because R&D expenditures are concentrated in relatively few companies, a completed response is needed from each surveyed firm — *there is no substitute for the information that you can provide*. Your company can be assured of complete confidentiality. Survey data will be released only in aggregate form so that responses of individual companies cannot be identified. We have enclosed a data brief from the 1995 survey to show you how these results are used.

If you have questions concerning the operation of this survey, please direct them to the Census Bureau on (301) 457-1339. In addition to the data brief, survey results also are made available in an annual report entitled *Research and Development in Industry*. If you would like to receive a copy of the most recent report, please call the NSF publication distribution center on (301) 947-2722 or send an e-mail message to [pubs@nsf.gov](mailto:pubs@nsf.gov).

Sincerely,

A handwritten signature in black ink that reads "Neal Lane".

Neal Lane  
Director

Enclosures



UNITED STATES DEPARTMENT OF COMMERCE

Bureau of the Census

Washington, DC 20233-0001

OFFICE OF THE DIRECTOR

FROM THE ACTING DIRECTOR  
BUREAU OF THE CENSUS

We have enclosed your company's report form and instructions for the 1997 "Survey of Industrial Research and Development (R&D)." This survey provides information for examining R&D tax credits. Some businesses are able to use R&D tax credits to reduce their Federal tax burden. The data assist public officials in allocating research funding by state, which may benefit companies like yours. Analysts also use the results to compare spending in this country with others to ensure that U.S. businesses are not at a competitive disadvantage.

In addition to the traditional report form, we have included a computerized self-administered questionnaire diskette that you may use as an alternative format for reporting. Please refer to the instructions for installation. If you have any questions about installing or using the diskette, please contact the Electronic Reporting Staff on 1-301-457-4125.

The diskette and Form RD-1(L) contain information from the previous report for your company. **Please review the instructions, complete the diskette or the form, and return it within 60 days.** Federal law requires your response to four items identified on the form. Your voluntary response to all other items is needed to assure useful results.

Information you report should cover the domestic operations of your consolidated enterprise for calendar year 1997. We recognize that providing this information is a burden, and we have worked hard to minimize it. For example, if you do not have book records for any item, **you may provide carefully prepared estimates.** The law that authorizes this survey (Title 13, United States Code) requires that we keep your report in full confidence. Only sworn Census Bureau employees will see your information and they will use it only for statistical purposes.

We conduct this survey with National Science Foundation (NSF) support. We have enclosed a letter from the Director of NSF encouraging your response to the survey. If you have any questions, please call my staff on (301) 457-1339. Thank you in advance for your cooperation.

Sincerely,

A handwritten signature in black ink that reads "James F. Holmes".

James F. Holmes

Enclosures

**NOTICE** - Your report to the Census Bureau is **confidential** by law (Title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

**CENSUS  
USE  
ONLY**FORM RD-1(L)  
(11-12-97)

U.S. DEPARTMENT OF COMMERCE  
BUREAU OF THE CENSUS  
COLLECTING AND COMPILING AGENT FOR  
**THE NATIONAL SCIENCE FOUNDATION**

**SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1997**

In correspondence pertaining to this report refer  
to this **CENSUS FILE NUMBER (11 digits)** ➤

RETURN  
TO

Bureau of the Census  
1201 East 10th Street  
Jeffersonville, IN 47132-0001

Name of person who supplied 1996 data

Data supplied in items 1A and 1B and in item 3A, line 3, columns 4 and 6, for 1997 on this form will satisfy the mandatory reporting requirements. (Title 13, U.S. Code.)

PLEASE READ ENCLOSED INSTRUCTIONS  
BEFORE COMPLETING THIS FORM.

SURVEY CODE

4001

INDUSTRY CODE

WEIGHT

STATE

ADDRESS

SIC CODE

(Please correct any error in name and address, including ZIP Code.)

**THIS REPORT SHOULD COVER YOUR ENTIRE CONSOLIDATED DOMESTIC ENTERPRISE, INCLUDING ALL U.S. SUBSIDIARIES AND DIVISIONS.**

The term "company" on this form refers to the consolidated domestic enterprise.

- Please complete this form by the date printed at the top of this page and return it in the envelope provided. Make a copy for your records.
- Please read the enclosed instructions before completing this form.
- Report figures in thousands of dollars. Reasonable estimates are acceptable.
- Explain significant changes in year-to-year data in the remarks section.

**COVERAGE REVIEW**

Was this company owned or controlled by another company on December 31, 1997?

1303  Yes - See instructions for Coverage Review.1304  No - Continue with item 1

## Section I - GENERAL COMPANY DATA

### Item 1 - RECEIPTS AND EMPLOYMENT FOR THE COMPANY

**A. Net sales, operating receipts and revenues of domestic operations of this company (Report in thousands of dollars)**

INCLUDE receipts for sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries.

EXCLUDE domestic intra-company transfers and sales by foreign subsidiaries.

| 1996   |      |       | 1997   |      |       |
|--------|------|-------|--------|------|-------|
| Bil.   | Mil. | Thou. | Bil.   | Mil. | Thou. |
| 101    |      |       | 102    |      |       |
| Number |      |       | Number |      |       |
| 111    |      |       | 112    |      |       |

**B. Domestic company employment in all activities during the pay period which includes the 12th of March 1997 (Item 1 of I.R.S. Form 941, if one Form 941 was filled for the entire company.)**

**January 1997**

**January 1998**

Number

Number

503

504

505

506

501

502

### Item 2 - NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Apportion on a full-time equivalent basis. See page 4 of the instruction booklet for more detail.

**A. Federal research and development**

Number

**B. Company and other research and development**

Number

**C. TOTAL - Sum of lines 2A and 2B**

Number

### Item 3 - COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

(Report in thousands of dollars)

| A. Performed within the company   | 1996                 |      |       |                          |      |       | 1997                   |      |       |                      |      |       |                          |      |       |                        |      |       |
|---|----------------------|------|-------|--------------------------|------|-------|------------------------|------|-------|----------------------|------|-------|--------------------------|------|-------|------------------------|------|-------|
|   | Federal funds<br>(1) |      |       | Company and other<br>(2) |      |       | Total ((1)+(2))<br>(3) |      |       | Federal funds<br>(4) |      |       | Company and other<br>(5) |      |       | Total ((4)+(5))<br>(6) |      |       |
|   | Bil.                 | Mil. | Thou. | Bil.                     | Mil. | Thou. | Bil.                   | Mil. | Thou. | Bil.                 | Mil. | Thou. | Bil.                     | Mil. | Thou. | Bil.                   | Mil. | Thou. |
| 1. Basic research -<br>If "NONE," please mark (X) here  | 301                  |      |       | 302                      |      |       | 303                    |      |       | 304                  |      |       | 305                      |      |       | 306                    |      |       |
| a. Applied research   | 311                  |      |       | 312                      |      |       | 313                    |      |       | 314                  |      |       | 315                      |      |       | 316                    |      |       |
| b. Development  | 321                  |      |       | 322                      |      |       | 323                    |      |       | 324                  |      |       | 325                      |      |       | 326                    |      |       |
| c. Total - Sum of lines a and b   | 331                  |      |       | 332                      |      |       | 333                    |      |       | 334                  |      |       | 335                      |      |       | 336                    |      |       |
| 3. Total - Sum of lines 1 and 2.c.  | 341                  |      |       | 342                      |      |       | 343                    |      |       | 344                  |      |       | 345                      |      |       | 346                    |      |       |
| B. Outside the company - <b>Federal</b> funds and <b>company</b> funds for research and development performed by others outside the company within the United States (Exclude from 3A.3. above)             | 351                  |      |       | 352                      |      |       | 353                    |      |       | 354                  |      |       | 355                      |      |       | 356                    |      |       |
| C. Foreign - <b>Company</b> funds for research and development performed by foreign subsidiaries or other organizations outside the United States (Exclude from 3A.3. and 3B. above)                        |                      |      |       | 362                      |      |       |                        |      |       |                      |      |       | 365                      |      |       |                        |      |       |
| D. <b>TOTAL - Company and other funds, except Federal</b> (This line represents company sponsored research and development with the exception of "other funds.") - <b>Sum of 3A.3. (column 2), B, and C</b> |                      |      |       | 372                      |      |       |                        |      |       |                      |      |       | 375                      |      |       |                        |      |       |

### Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1998

| 1998 |      |       |
|------|------|-------|
| Bil. | Mil. | Thou. |
| 401  |      |       |

(Comparable to the 1997 figure reported in Item 3.A.3., column (5).)

## Section II - RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY

### Item 5 - COSTS INCURRED FOR FEDERAL RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY PRINCIPAL GOVERNMENT AGENCY

Allocate the total reported in Item 3.A., line 3, column (4), Federal funds, into the following principal agencies:

1. Department of Defense

| Key code | 1995 (1) |      |       | 1996 | 1997 (2) |      |       |
|----------|----------|------|-------|------|----------|------|-------|
|          | Bil.     | Mil. | Thou. |      | Bil.     | Mil. | Thou. |
| 5        |          |      |       | N    |          |      |       |
| 01       |          |      |       | O    |          |      |       |
| 02       |          |      |       | T    |          |      |       |
| 03       |          |      |       | A    |          |      |       |
| 04       |          |      |       | S    |          |      |       |
| 05       |          |      |       | K    |          |      |       |
|          |          |      |       | E    |          |      |       |
|          |          |      |       | D    |          |      |       |

5. **TOTAL COSTS - Sum of lines 1 through 4**

### Item 6 - COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE OF EXPENSE

Allocate the total reported in Item 3.A., line 3, column (6), total company research and development - Exclude lines 3.B. and 3.C.

1. Wages and salaries of research and development personnel - *Include scientists and engineers, technicians, secretaries, and other personnel.*

| Key code | 1995 (1) |      |       | 1996 | 1997 (2) |      |       |
|----------|----------|------|-------|------|----------|------|-------|
|          | Bil.     | Mil. | Thou. |      | Bil.     | Mil. | Thou. |
| 6        |          |      |       | N    |          |      |       |
| 01       |          |      |       | O    |          |      |       |
| 02       |          |      |       | T    |          |      |       |
| 03       |          |      |       | A    |          |      |       |
| 04       |          |      |       | S    |          |      |       |
|          |          |      |       | K    |          |      |       |
|          |          |      |       | E    |          |      |       |
|          |          |      |       | D    |          |      |       |

2. Costs of materials and supplies consumed - *Do not include in this item components, models, and other materials supplied by other research organizations.*

3. Other costs - *Include service and supporting costs, R&D depreciation, and share of overhead.*

4. **TOTAL COSTS - Sum of lines 1 through 3**

PLEASE CONTINUE ON NEXT PAGE

| FORM RD-1(L) (Items 7-9)<br>(11-12-97)  |   | U.S. DEPARTMENT OF COMMERCE<br>BUREAU OF THE CENSUS<br>COLLECTING AND COMPILED AGENT FOR<br>THE NATIONAL SCIENCE FOUNDATION |    |                      |                    |      |      | Refer to this CENSUS<br>FILE NUMBER in any<br>correspondence<br>pertaining to this report |      |          |             |      |      |             |      |      |      |
|---|---|---|----|----------------------|--------------------|------|------|---|------|----------|-------------|------|------|-------------|------|------|------|
| Section II — RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY — Continued   |   |   |    |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| Item 7 — FIELDS OF BASIC RESEARCH PERFORMED WITHIN THE COMPANY  |   |   |    |                      |                    |      |      |   |      | Key code | 1995<br>(1) |      | 1996 | 1997<br>(2) |      |      |      |
| Allocate the total reported in Item 3.A., line 1, column (6), basic research, into the following fields of science and engineering.   |   |   |    |                      |                    |      |      |   |      |          | Bil.        | Mil. |      | Thou        | Bil. | Mil. | Thou |
| 1. Chemistry  |   | 01  |    |                      | N                  |      |      |   |      |          |             |      |      |             |      |      |      |
| 2. Engineering (including metallurgy)   |   | 02  |    |                      | O                  |      |      |   |      |          |             |      |      |             |      |      |      |
| 3. Geological Sciences  |   | 03  |    |                      | T                  |      |      |   |      |          |             |      |      |             |      |      |      |
| 4. Mathematics  |   | 04  |    |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 5. Computer Sciences  |   | 05  |    |                      | A                  |      |      |   |      |          |             |      |      |             |      |      |      |
| 6. Physics  |   | 06  |    |                      | S                  |      |      |   |      |          |             |      |      |             |      |      |      |
| 7. Astronomy  |   | 07  |    |                      | K                  |      |      |   |      |          |             |      |      |             |      |      |      |
| 8. Atmospheric Sciences   |   | 08  |    |                      | E                  |      |      |   |      |          |             |      |      |             |      |      |      |
| 9. Oceanography   |   | 09  |    |                      | D                  |      |      |   |      |          |             |      |      |             |      |      |      |
| 10. Biological Sciences   |   | 10  |    |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 11. Clinical Medical Sciences   |   | 11  |    |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 12. Other —Specify  |   | 12  |    |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| <b>13. TOTAL BASIC RESEARCH COSTS — Sum of lines 1 through 12</b>   |   | 13  |    |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| Item 8 — APPLIED RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY PRODUCT GROUP   |   |   |    |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| Allocate the totals reported as applied research and development in Item 3.A., line 2.c., columns (4) and (6), into the following product groups and funding sources. These product groups represent the END PRODUCT for the firm. See page 7 of the instruction booklet for detailed descriptions of product groups. |   |   |    |                      |                    |      |      |   |      | Key code | 1995        |      |      | 1996        | 1997 |      |      |
| No.   | SIC Group   | Product class   | 8  | Federal funds<br>(1) | Total funds<br>(2) | Bil. | Mil. | Thou  | Bil. |          | Mil.        | Thou |      |             |      |      |      |
| 1   | 20  | Food and kindred products   | 01 |                      |                    |      |      |   | N    |          |             |      |      |             |      |      |      |
| 2   | 22  | Textile mill products   | 02 |                      |                    |      |      |   | O    |          |             |      |      |             |      |      |      |
| 3   | 24  | Lumber and wood products  | 03 |                      |                    |      |      |   | T    |          |             |      |      |             |      |      |      |
| 4   | 26  | Paper and allied products   | 04 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 5   | 281, 286  | Industrial inorganic and organic chemicals  | 05 |                      |                    |      |      |   | A    |          |             |      |      |             |      |      |      |
| 6   | 282   | Plastics materials and synthetic resins, rubber, and fiber  | 06 |                      |                    |      |      |   | S    |          |             |      |      |             |      |      |      |
| 7   | 283   | Drugs   | 07 |                      |                    |      |      |   | K    |          |             |      |      |             |      |      |      |
| 8   | 287   | Agricultural chemicals  | 08 |                      |                    |      |      |   | E    |          |             |      |      |             |      |      |      |
| 9   | Balance of SIC 28 group   | Cleaning supplies, toiletries, and paints   | 09 |                      |                    |      |      |   | D    |          |             |      |      |             |      |      |      |
| 10  | 29, 13  | Petroleum refining, and oil and gas extraction  | 10 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 11  | 30  | Rubber and miscellaneous plastics products  | 11 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 12  | 31  | Leather   | 12 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 13  | 32  | Stone, clay, glass, and concrete products   | 13 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 14  | 331, 332, 3399  | Primary ferrous products  | 14 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 15  | Balance of SIC 33 group   | Primary and secondary nonferrous metals   | 15 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 16  | 348   | Ordnance, except missiles   | 16 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 17  | Balance of 34   | Fabricated metal products   | 17 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 18  | 351   | Engines and turbines  | 18 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 19  | 352   | Farm machinery and equipment  | 19 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 20  | 353   | Construction, mining, and materials handling machinery  | 20 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 21  | 354   | Metal working machinery and equipment   | 21 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 22  | 357   | Office, computing, and accounting machines  | 22 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 23  | Balance of SIC 35 group   | Other machinery, except electrical  | 23 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 24  | 361   | Electric transmission and distribution equipment  | 24 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 25  | 362   | Electrical industrial apparatus   | 25 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 26  | 365   | Radio and television receiving sets, except communication types   | 26 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 27  | 366   | Communications equipment  | 27 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 28  | 367   | Electronic components and accessories   | 28 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 29  | Balance of SIC 36 group   | Other electrical machinery equipment and supplies   | 29 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 30  | 371   | Motor vehicles and equipment  | 30 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 31  | 372   | Aircraft and parts  | 31 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 32  | 376   | Missiles and space vehicles   | 32 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 33  | Balance of SIC 37 group   | Other transportation equipment  | 33 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 34  | 381-2   | Scientific and mechanical measuring instruments   | 34 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 35  | Balance of SIC 38 group   | Optical, surgical, photographic, and other instruments  | 35 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 36  | 737   | Software  | 36 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 37  |   | Other —Specify  | 37 |                      |                    |      |      |   |      |          |             |      |      |             |      |      |      |
| 38  | <b>TOTAL APPLIED RESEARCH AND DEVELOPMENT COSTS — Sum of lines 1 through 37</b> |   |    | 38                   |                    |      |      |   |      |          |             |      |      |             |      |      |      |

► Item 9 — COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY STATE

Allocate the total reported in Item 3.A., line 3, columns (4) and (6), by the States in which your various research and development laboratories or facilities are located. Estimate the costs associated with each State. If necessary, you may report up to 10 percent of your total as "Not distributed by State."

| Key<br>code | State  | 1995                 |      |                    | 1997                 |      |                    | Key<br>code | State | 1995                 |      |                    | 1997                 |      |                    |   |
|-------------|--|----------------------|------|--------------------|----------------------|------|--------------------|-------------|-------|----------------------|------|--------------------|----------------------|------|--------------------|---|
|             |  | Federal funds<br>(1) |      | Total funds<br>(2) | Federal funds<br>(1) |      | Total funds<br>(2) |             |       | Federal funds<br>(1) |      | Total funds<br>(2) | Federal funds<br>(1) |      | Total funds<br>(2) |   |
|             |  | Bil.                 | Mil. | Thou               | Bil.                 | Mil. | Thou               |             |       | Bil.                 | Mil. | Thou               | Bil.                 | Mil. | Thou               |   |
| 01          | AL   |                      |      |                    | N                    |      |                    | 27          | MT    |                      |      |                    | N                    |      |                    |   |
| 02          | AK   | 1                    | 1    |                    | O                    | 1    | 1                  | 28          | NE    | 1                    | 1    |                    | O                    | 1    | 1                  |   |
| 03          | AZ   | 1                    | 1    |                    | T                    | 1    | 1                  | 29          | NV    | 1                    | 1    |                    | T                    | 1    | 1                  |   |
| 04          | AR   | 1                    | 1    |                    |                      | 1    | 1                  | 30          | NH    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 05          | CA   | 1                    | 1    |                    | A                    | 1    | 1                  | 31          | NJ    | 1                    | 1    | 1                  | A                    | 1    | 1                  |   |
| 06          | CO   | 1                    | 1    |                    | S                    | 1    | 1                  | 32          | NM    | 1                    | 1    |                    | S                    | 1    | 1                  |   |
| 07          | CT   | 1                    | 1    |                    | K                    | 1    | 1                  | 33          | NY    | 1                    | 1    |                    | K                    | 1    | 1                  |   |
| 08          | DE   | 1                    | 1    |                    | E                    | 1    | 1                  | 34          | NC    | 1                    | 1    | 1                  | E                    | 1    | 1                  |   |
| 09          | DC   | 1                    | 1    |                    | D                    | 1    | 1                  | 35          | ND    | 1                    | 1    |                    | D                    | 1    | 1                  |   |
| 10          | FL   | 1                    | 1    |                    |                      | 1    | 1                  | 36          | OH    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 11          | GA   | 1                    | 1    |                    |                      | 1    | 1                  | 37          | OK    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 12          | HI   | 1                    | 1    |                    |                      | 1    | 1                  | 38          | OR    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 13          | ID   | 1                    | 1    |                    |                      | 1    | 1                  | 39          | PA    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 14          | IL   | 1                    | 1    |                    |                      | 1    | 1                  | 40          | RI    | 1                    | 1    | 1                  |                      | 1    | 1                  |   |
| 15          | IN   | 1                    | 1    |                    |                      | 1    | 1                  | 41          | SC    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 16          | IA   | 1                    | 1    |                    |                      | 1    | 1                  | 42          | SD    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 17          | KS   | 1                    | 1    |                    |                      | 1    | 1                  | 43          | TN    | 1                    | 1    | 1                  |                      | 1    | 1                  |   |
| 18          | KY   | 1                    | 1    |                    |                      | 1    | 1                  | 44          | TX    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 19          | LA   | 1                    | 1    |                    |                      | 1    | 1                  | 45          | UT    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 20          | ME   | 1                    | 1    |                    |                      | 1    | 1                  | 46          | VT    | 1                    | 1    | 1                  |                      | 1    | 1                  |   |
| 21          | MD   | 1                    | 1    |                    |                      | 1    | 1                  | 47          | VA    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 22          | MA   | 1                    | 1    |                    |                      | 1    | 1                  | 48          | WA    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 23          | MI   | 1                    | 1    |                    |                      | 1    | 1                  | 49          | WV    | 1                    | 1    | 1                  |                      | 1    | 1                  |   |
| 24          | MN   | 1                    | 1    |                    |                      | 1    | 1                  | 50          | WI    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 25          | MS   | 1                    | 1    |                    |                      | 1    | 1                  | 51          | WY    | 1                    | 1    |                    |                      | 1    | 1                  |   |
| 26          | MO   | 1                    | 1    |                    |                      | 1    | 1                  | 52          | *     | 1                    | 1    | 1                  |                      | 1    | 1                  |   |
| 53          | <b>TOTAL COSTS — Sum of lines 1 through 52</b> |                      |      |                    |                      |      |                    | 953         |       | 1                    | 1    | 1                  |                      | 954  | 1                  | 1 |

\*Not distributed by State

PLEASE CONTINUE ON NEXT PAGE

**Refer to this CENSUS  
FILE NUMBER in any  
correspondence  
pertaining to this report**

## **SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1997**

**Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY – Continued**

► Item 10 - ENERGY RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY

- Report expenditures for energy research and development by type of energy sources. Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. These expenditures should be included in Item 3.A. line 3, columns (4) and (6).

- Estimate expenditures for energy research by energy source for 1998.

**► Item 11 – POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY**

- Report expenditures for pollution abatement by the form of pollution to be abated. Include the project cost or portion of the project cost incurred for the purpose of designing pollution abatement products or product characteristics or of designing pollution abatement features into processes. These expenditures should be included in Item 3.A., line 3, columns (4) and (6).

- Estimate expenditures for pollution abatement research for 1998.

**Section III – RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS**

**Item 12 – FOREIGN RESEARCH AND DEVELOPMENT BY COUNTRY**

Report the amount of total foreign research and development, Item 3.C., column (5), for the countries with the largest expenditures. If necessary, write in countries not listed. Report the balance of foreign research and development on line 9.

| Key code | 1997 |      |      |
|----------|------|------|------|
|          | 12   | Bil. | Mil. |
| 01       |      |      |      |
| 02       |      |      |      |
| 03       |      |      |      |
| 04       |      |      |      |
| 05       |      |      |      |
| 06       |      |      |      |
| 07       |      |      |      |
| 08       |      |      |      |
| 09       |      |      |      |
| 10       |      |      |      |

1. Canada  
2. Germany  
3. France  
4. Japan  
5. United Kingdom  
6. Puerto Rico

7. Other — *Specify*

8. Other — *Specify*

9. Balance not distributed

10. **TOTAL – Sum of lines 1 through 9** →

**Item 13 – COVERAGE AND OPERATIONAL STATUS**

A. Are research and development expenditures for the entire domestic enterprise, including subsidiaries, reported on this form?

1301  Yes

1302  No – Please explain in the "Remarks" section on the back of the page.

B. New owner information

602 Name

603 Address (*Number and street*)

604 City

605 State

606 ZIP Code

**Item 14 – CERTIFICATION** – This report is substantially accurate and has been prepared in accordance with instructions

Name of person to contact regarding this report

|   |           |           |        |           |
|---|-----------|-----------|--------|-----------|
| Name of person to contact regarding this report | Telephone | Area code | Number | Extension |
|---|-----------|-----------|--------|-----------|

Signature of authorized official

Title

701 Date

USE REVERSE SIDE FOR REMARKS

801 REMARKS

**INSTRUCTIONS FOR SURVEY OF INDUSTRIAL  
RESEARCH AND DEVELOPMENT DURING 1997  
FORM RD-1 L**

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## GENERAL INSTRUCTIONS

Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development (R&D) not available from any other source. By carefully completing this report, the accuracy of this information is assured.

**DUE DATE** – Please complete and return this form in the envelope provided within 60 days. Make a copy for your records.

**SURVEY SCOPE** – This report covers publicly traded and privately-owned, nonfarm business firms in all sectors of the United States economy. It does not include operations owned by Federal, state or local governments, nonprofit organizations, or trust or pension plans.

If your company is owned by a Federal, state or local government, is a nonprofit organization, or is a trust or pension plan which performs no activity other than investments, do not report. Please note in the remarks section on the back page of the form and return it.

**REPORTING ENTITY** – Report research and development activities for all domestic operations of your **entire consolidated domestic enterprise**, including subsidiaries and divisions. The term "company" in these instructions refers to the consolidated domestic enterprise. Report for all parts of the company located in the 50 states and the District of Columbia. Report net receipts and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 states or the District of Columbia.

If this form has been directed to a holding company, report for all subsidiaries and operations under the ownership and control of the holding company.

If you report separately for a component of this company based upon an arrangement with the Census Bureau, please continue to do so.

**COVERAGE REVIEW** – Check the appropriate box if this company was owned or controlled by another company on December 31, 1997. If yes, follow the instructions below:

- If you have been reporting separately for this component of the company based upon an arrangement with the Census Bureau, please complete the form.
- If your company is owned by a foreign company, please complete the form and fill out the new owner information in Item 13B, page 3.

- If your company was purchased by another company on or prior to March 31, 1997, please complete the new owner information in Item 13B, page 3, sign the form in Item 14, and fax the form to (301) 457-1318.
- If your company was purchased after March 31, 1997, please complete the form for the months prior to the purchase of your company, fill out the new owner information in Item 13B, page 3, and return the form in the envelope provided.

If you have questions, please call the R&D Survey staff at (301) 457-4677 to determine whether you are required to complete the form.

**PERIOD COVERED BY THE REPORT** – Report figures for calendar year 1997. Fiscal year data are acceptable for all items except for employment, provided your fiscal year ends between September 1997 and March 1998. Please report employment figures (Items 1B and 2) for the specific times indicated for these items.

**HOW TO REPORT** – Report all value figures in thousands of dollars. If you cannot answer a question from your company records, please estimate the answer carefully.

Example: 1,123,678,599 dollars.

|        | Bil. | Mil. | Thou. |
|--------|------|------|-------|
| Report | \$1  | 123  | 679   |

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124

|        | Bil. | Mil. | Thou. |
|--------|------|------|-------|
| Report | \$1  | 124  | 000   |

**FIGURES FOR 1996 PRINTED ON THE FORM** – If your company reported for 1996, entries from that form have been printed on the present form. If these figures are incorrect, please revise them. Please describe in the "Remarks" section the reasons for any substantial increase or decrease in the 1997 figures entered on this form when compared to corresponding 1996 figures or changes in the 1996 figures. Examples of such reasons are new government contracts, acquisitions and divestitures, and revised accounting method. If you acquired or disposed of a unit performing an important amount of research and development during the 2-year period, please identify the unit in "Remarks," and give the total amount of research and development accounted for by that unit.

**ADDITIONAL FORMS** – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 218-3331.

## GENERAL INSTRUCTIONS – Continued

**FILING EXTENSIONS** – If you cannot complete the form in 60 days, request an extension of time by:

- calling the Census Touchtone Data Entry System on 1-800-851-2014 (have your 10-digit Census File Number, "CFN", available. The CFN is printed on the form above your address.)

OR

- writing to the address below (Please include your 10-digit Census File Number):

Bureau of the Census  
1201 East 10th Street  
Jeffersonville, IN 47132-0001

**ALTERNATIVE REPORTING FORMATS** – Along with the survey form, some companies received a computer diskette. Reporting your company information on the diskette is an alternative means of completing the survey. **If you do report on the diskette do not mail in the paper form.**

Receiving your data on diskette benefits us through reduced processing costs. Please refer questions concerning operation of the diskette to the Electronic Reporting Staff at (301) 457-4125.

**BURDEN HOUR ESTIMATE** – Public reporting burden for this collection of information is estimated to average 20 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information, including suggestions for reducing this burden, to Gail A. McHenry, National Science Foundation, 4201 Wilson Boulevard, Room 485, Arlington, VA 22230.

Direct **QUESTIONS** regarding this form to the Bureau of the Census, Manufacturing and Construction Division, ATTN.: Special Studies Branch, Room 2135/4, Washington, DC 20233-6900, call (301) 457-1339 or E-mail to ronald.w.taylor@ccmail.census.gov. (Please see the instructions for Item 14 on page 11 for E-mail warning.)

## DEFINITION OF RESEARCH AND DEVELOPMENT

R&D includes basic and applied research in the sciences and engineering. It also includes design and development of new products and processes and enhancement of existing products and processes.

R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences such as chemistry and physics, the biological sciences such as medicine, and engineering and computer science. R&D includes these activities if the purpose is to do one or more of the following things:

1. Pursue a planned search for **new knowledge**, whether or not the search has reference to a specific application. (Basic research)
2. Apply **existing knowledge** to problems involved in the **creation of a new product or process**, including work required to evaluate possible uses. (Applied research)
3. Apply **existing knowledge** to problems involved in the **improvement of a present product or process**. (Development)

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of your responses,

Activities to be **excluded** from R&D:

- Routine product testing
- Geological and geophysical exploration activities

- Technical services such as:

- quality and quantity control
- technical plant sanitation control
- trouble-shooting in connection with breakdowns in full-scale production

- Advertising programs to promote or demonstrate new products or processes
- Assistance in preparation of speeches and publications for persons not engaged in research and development.

- Social Science R&D which is defined to encompass those activities devoted to further understanding the behavior of groups of human beings or of individuals as members of groups. Some of the topics include the following:

- Personnel R&D
- Economic R&D
- Artificial intelligence and expert systems R&D
- Consumer, market, and opinion R&D
- Engineering psychology R&D
- Management and organization R&D
- Actuarial and demographic R&D
- Educational processes and applications R&D
- R&D in law

## ITEM BY ITEM INSTRUCTIONS

### Section I – GENERAL COMPANY DATA

#### Item 1 – RECEIPTS AND EMPLOYMENT FOR THE COMPANY

##### Item IA – Net Sales, Operating Receipts and Revenues

Include:

- Sales, operating receipts and revenues from all domestic operations of the company. This includes receipts from sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries.
- Net selling value of shipments, f.o.b. plant, after discounts and allowances minus freight charges and excise taxes
- Revenue from investments, rents, and royalties only if it is the principal business of the company. Finance, Insurance and Real Estate companies should include interest, dividends, commissions and rental income as part of revenues.
- Value of assets sold under a capital lease agreement
- Export transfers to your foreign subsidiaries

Exclude:

- Sales and other taxes collected and paid directly to government taxing agencies
- Domestic intra-company transfers
- Receipts from sale of products and services provided by your foreign subsidiaries
- Income from interest, dividends and commissions, except for Finance, Insurance and Real Estate companies
- Other nonoperating income (e.g., royalties)

#### Item 1 B – Domestic Company Employment

Include:

- The number of full and part-time employees of the company as defined on Treasury Form 941, Employer's Quarterly Federal Tax Return, and Circular E, Employer's Tax Guide, if filed for the entire company.
- The number of employees in all activities in the 50 States and the District of Columbia during the pay period which includes March 12, 1997.
- Persons on paid sick leave, paid holidays, and paid vacations during the pay period which includes March 12, 1997.

Report the number of employees, not payroll.

#### Item 2 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics. Their experience is equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number of scientists and engineers employed in January, 1998.
2. For employees whose activities are not solely devoted to R&D, report the proportion of their time that is devoted to R&D. For example, if a company had the full-time equivalent of 60 scientists and engineers in January 1998 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

#### Item 3 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

##### ► Source of Funds for Research and Development Costs

###### Federal funds

Include:

- Federally-sponsored research and development performed within the company. Include only the amount of work done on Federal R&D contracts or subcontracts in the current year.
- R&D portion of procurement contracts or subcontracts

Exclude:

- For Item 3A exclude Federal R&D contracts and R&D portions of procurement contracts that your company subcontracted to other R&D organizations. Including these funds would cause duplication in the statistical totals, which include data on work actually performed by each company. Report subcontracted costs in Item 3B.
- Expenditures for independent research and development (IR&D). These are included in company funds. (See definition below.)

###### Company and other funds

Include:

- Company-sponsored research and development performed within the company and R&D performed under contract from non-Federal sources

## ITEM BY ITEM INSTRUCTIONS – Continued

### **Item 3 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT – Continued**

#### **Company and other funds – Continued**

Include:

- Costs for independent research and development (IR&D). We define IR&D funds as R&D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services. Qualified projects usually have potential interest to the Department of Defense or other agencies of the Federal government. These IR&D funds are excluded from federal funds received for federally-sponsored research and development contracts. . .
- Costs for which you anticipate reimbursement as company funds. Report expenditures in the period for which they are incurred. Do not include the actual reimbursement.

### **Item 3A – PERFORMED WITHIN THE COMPANY**

#### **► Types of R&D Costs**

**Include** as R&D costs:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation
- Cost of computer software used in R&D activities
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expenses
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

**Exclude** as R&D costs:

- Capital expenditures
- Patent expenses
- Income taxes and interest
- R&D performed abroad (see Item 3C), such as in Canada and Puerto Rico
- R&D performed by non-company R&D organizations of any kind (see Item 3B)

- Portion of company-held R&D contracts that are subcontracted outside the reporting company (see Item 3B)
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

#### **Item 3A.1 – Basic Research**

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, although they may be in the fields of present or potential interest to the reporting company.

If your company performs no basic research, please check the box in item 3A.1 and report zeros in line 1, columns 4, 5, and 6.

#### **Item 3A.2a – Applied Research**

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

#### **Item 3A.2b – Development**

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research into products or processes.

Include:

- Software development
- Design and operation of pilot plants and semi-work plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models including test models for defense contracts
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals

Exclude:

- Routine technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

## **ITEM BY ITEM INSTRUCTIONS – Continued**

### **Item 3A.2c – Total Costs for Applied Research and Development**

Add line 3A.2a and line 3A.2b.

### **Item 3A.3 – Total Costs for Basic and Applied Research and Development Performed Within the Company**

Add line 3A.1 and line 3A.2c.

#### **► Estimating basic, applied, and development expenditures**

If your company does not keep records that can be allocated to these specific categories, estimate by the following:

1. Isolate projects that clearly fall into the development category of R&D costs. If your company fabricates products, development activity will include the design, construction, and testing of prototypes and models. If your company's R&D involves the development of a "process" as in chemicals and petroleum, this development activity would primarily include the design and operation of pilot plants or semi-work plants.
2. Isolate the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. R&D work performed in production units as well as in various laboratories is generally classified as development R&D.
3. Distribute the balance of R&D costs on the basis of individual projects or on the basis of other summaries of the work.

### **Item 3B – OUTSIDE THE COMPANY**

Report payments in the form of contracts, grants, and fellowships made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions or other organizations.

**Federal Funds (column 4):** Report R&D activities that your company subcontracted to other organizations using **federal funds** you received for R&D contracts and R&D portions of procurement contracts.

**Company and Other Funds (column 5):** Report R&D activities that your company subcontracted to other organizations using **company or other nonfederal funds**.

### **Item 3C – FOREIGN**

Report the amount of R&D financed by the U.S. parent or its foreign subsidiaries, including Canada and Puerto Rico, and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States. Foreign subsidiaries are those outside the 50 States and the District of Columbia.

Exclude R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations.

### **Item 3D – TOTAL**

With the exception of "Other funds," this number represents company-sponsored R&D. It is comparable to information reported on Form 10K, if you report to the Securities and Exchange Commission.

Add line 3A.3 (column 5), line 3B (column 5) , and line 3C.

### **Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1998**

Report the estimated cost of company and other nonfederally sponsored R&D that will be performed within the 50 states and the District of Columbia in 1998. This item is comparable to the 1997 figure reported in Item 3A.3, column 5.

## **Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY**

### **Item 5 – COSTS INCURRED FOR FEDERAL RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY PRINCIPAL GOVERNMENT AGENCY**

Distribute the cost of Federal research and development work (Item 3A, line 3, columns 1 and 4) by Federal agency – If exact figures are not available by agency, please estimate or apportion according to the number of scientists and engineers working on the Federal projects and/or the costs of Federal programs.

### **Item 6 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE OF EXPENSE**

If most R&D is performed in units where summaries are regularly prepared by element of cost, base the breakdown of research and development costs upon the records of such units. If existing records do not yield figures for this item, the item may be estimated.

#### **Item 6.1 – Wages and Salaries**

Report the gross earnings paid in calendar year 1995 to employees engaged in R&D (follow the definition of salaries and wages that is used for calculating the withholding tax). Include salaries of officers in the research establishment(s) if a corporation; exclude payments to proprietor or partners if an unincorporated concern. (Scientists and engineers are defined in item 2.) Exclude employee fringe benefits which are to be reported in Item 6.3 – Other costs.

## **ITEM BY ITEM INSTRUCTIONS – Continued**

### **Item 6.2 – Materials and Supplies**

Report the delivered cost for all purchased materials consumed, whether received from other companies, withdrawn from inventory, or received from other establishments of this company. Include all work that was done for your laboratories and other technical units by non-company organizations (for example, model construction by a non-company model shop). Exclude purchases from other R&D organizations.

### **Item 6.3 – Other Costs**

Include items related to your R&D activities and not included in Items 6.1 and 6.2. Include utilities, books and periodicals, property and other taxes, employee fringe benefits, and company overhead.

### **Item 7 – FIELDS OF BASIC RESEARCH PERFORMED WITHIN THE COMPANY**

Use the following definitions to help you divide your company's basic research into broad research fields.

#### **Item 7.1– Chemistry**

Includes inorganic, organo-metallic, organic, and physical.

#### **Item 7.2 – Engineering (Including metallurgy)**

Includes aeronautical (including aerospace and space technology), chemical, nuclear, civil, electrical, and mechanical engineering, etc.) and metallurgy and materials.

#### **Item 7.3 – Geological Sciences**

Includes geodesy, hydrology, geochemistry, seismology, soil sciences, etc.

#### **Item 7.4 – Mathematics**

Includes areas such as algebra; foundations and logic; geometry; numerical analysis, etc.

#### **Item 7.5 – Computer Sciences**

Includes activities directed toward enhancing the understanding of computer structures and computational processes to provide bases for the future capabilities for computational solutions of presently intractable problems.

#### **Item 7.6 – Physics**

Includes acoustics; atomic and molecular; condensed matter; elementary particle; nuclear structure; optics; plasma.

#### **Item 7.7 – Astronomy**

Includes laboratory astrophysics; optical astronomy; radio astronomy; theoretical astrophysics; Gamma-ray, neutrino astronomy.

### **Item 7.8 – Atmospheric Sciences**

Includes aeronomy; solar; weather modification; extraterrestrial atmospheres; meteorology.

### **Item 7.9 – Oceanography**

Includes biological oceanography; chemical oceanography; physical oceanography; marine geophysics.

### **Item 7.10 – Biological Sciences**

Includes all sciences (other than clinical medical sciences) which deal with life processes, including plant and animal sciences, biochemistry, cell biology, nutrition, microbiology, physiology, etc.

### **Item 7.11 – Clinical Medical Sciences**

Includes all sciences concerned with the use of scientific knowledge for the identification, treatment, and cure of disease including internal medicine, neurology, preventive medicine and public health, pathology, pharmacology, psychiatry, dentistry, veterinary medicine, etc.

### **Item 7.12 – Other Sciences**

To be used for multidisciplinary and interdisciplinary projects which cannot be classified within one of the above primary fields of science.

### **Item 7.13 – Total Basic Research Costs**

This should be the same as Item 3.A.1., columns 3 and 6.

### **Item 8 – APPLIED RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY PRODUCT GROUP**

Enter both Federal and total cost of applied R&D by product group. Costs should be entered in the field which is the END PRODUCT for the firm performing the R&D. For example, R&D in very large scale integrated (VLSI) circuits would be reported by a semiconductor firm on line 25, electrical industrial apparatus, if the chips are the final product sold by the firm. The same type of microelectronic R&D by a computer firm, however, would be reported on line 22, office, computing and accounting machines, if the chips are intended to be part of a computer which is the firm's end product.

Definitions for various fields of applied R&D are listed in the instructions for Items 8.1 through 8.37. For those companies familiar with the Standard Industrial Classification (SIC), the 1987 SIC codes are given after each title. Note that the SIC definition here applies to each field of R&D and effort, and not necessarily to the overall code in which your company's manufacturing output is classified.

Report cost of Federally funded applied R&D by product group in column 1, and total cost of applied R&D by product group (also including Federal) in column 2.

## **ITEM BY ITEM INSTRUCTIONS – Continued**

### **How To Report Atomic Energy Devices:**

- Radioactive isotopes and other radiation sources should be reported in line 8.5.
- Partially fabricated reactor fuel element materials and control rods should be reported in line 8.14.
- Nuclear reactors; reactor components and equipment; core structurals; heat exchangers and condensers; valves; complete reactor fuel elements and control rods for use in propulsion, power plants, and other; and atomic waste casks should be reported in line 8.17.
- Fuel handling equipment, control rod drive mechanism and components for power plants, propulsion, and other; pressurizers, components, and auxiliary equipment; and pumps should be reported in line 8.23.
- Atom smashers (particle accelerators) should be reported in line 8.29.
- Accessory instrumentation for reactor control should be reported in line 8.34.
- Hot laboratory equipment and special instrumentation should be reported in line 8.35.

### **Item 8.1 – Food and Kindred Products (SIC 20)**

Foods and beverages for human consumption and certain related products such as vegetable and animal fats and oils, and prepared feeds for animals and fowls.

### **Item 8.2 – Textile and Mill Products (SIC 22)**

Mill preparation of fibers and mill manufacture of yarn, thread, twine etc; manufacture of broadwoven and knit.

### **Item 8.3 – Lumber and Wood Products (SIC 24)**

Includes cutting timber and pulpwood: merchant sawmills, lath mills, shingle mills, cooperage stock mills, planing mills, and plywood mills and veneer mills engaged in producing lumber and wood basic materials; and establishments engaged in manufacturing finished articles made entirely or mainly of wood or related materials.

### **Item 8.4 – Paper and Allied Products (SIC 26)**

Includes manufacturing of pulps from wood and other cellulose fibers, and from rags; the manufacture of paper and paperboard; and the manufacture of paper and paperboard into converted products, such as paper coated off the paper machine, paper bags, paper boxes, and envelopes. Also included are establishments primarily engaged in manufacturing bags of plastic film and sheet.

### **Item 8.5 – Industrial Inorganic and Organic Chemicals (SIC 281 and 286)**

Includes alkalies and chlorine, industrial gases, inorganic pigments, and industrial inorganic chemicals not elsewhere classified (n.e.c.).

Also includes industrial organic chemicals including gum and wood chemicals, cyclic crudes, and cyclic intermediates, dyes, and organic pigments, and other industrial organic chemicals n.e.c. Includes radioactive isotopes and other radiation sources.

### **Item 8.6 – Plastics Materials and Synthetic Resins, Synthetic Rubber, Synthetic and Other Manmade Fibers (SIC 282)**

Includes cellulosic and noncellulosic fibers. Excludes glass which should be included in product group 13.

### **Item 8.7 Drugs (SIC 283)**

Medicinal chemicals, biological and botanical products, and pharmaceutical preparations.

### **Item 8.8 – Agricultural Chemicals (SIC 287)**

Fertilizers, agricultural pesticides, and other agricultural chemicals.

### **Item 8.9 – All Other Chemicals (Balance of SIC 28)**

Includes explosives, soaps, glycerins, detergents and cleaning preparations, paints and varnishes, toilet preparation, and miscellaneous chemical products.

### **Item 8.10 – Petroleum Refining and Related Industries, Oil and Gas Extraction (SIC 13 and 29)**

Excludes geological and geophysical exploration activities.

### **Item 8.11 – Rubber and Miscellaneous Plastics Products (SIC 30)**

Fabricated rubber such as industrial and mechanical rubber goods and fabricated plastics products.

### **Item 8.12 – Leather and Leather Products (SIC 31)**

Includes tanning, currying, and finishing hides and skins, leather converters, and establishments manufacturing finished leather and artificial leather products and some similar products made of other materials.

### **Item 8.13 – Stone, Clay, Glass, and Concrete Products (SIC 32)**

Ceramics, glass, clay products, abrasives and asbestos products, cement, stone products, concrete products, and other nonmetallic mineral products.

### **Item 8.14 – Primary Ferrous Products (SIC 331, 332, 3399, and 3462)**

Products of blast furnaces, steel works, rolling and finishing mills, iron and steel castings and forgings. Includes partially fabricated reactor fuel element materials and control rods.

## **ITEM BY ITEM INSTRUCTIONS – Continued**

**Item 8.15 – Primary and Secondary Nonferrous Metals (Balance of SIC 33 and 346)**

Primary and secondary smelting and refining of nonferrous metals, rolled, drawn, and extruded nonferrous metals products, castings and forgings.

**Item 8.16 – Ordnance, Except Missiles (SIC 348, 3795)**

Artillery, small arms, ammunition, tanks and parts, etc.

**Item 8.17 – Fabricated Metal Products (SIC 34 Except 3462, 3463, and 348, Ferrous and Nonferrous Forgings, Ordnance)**

Tinware, hand tools, nonelectric heating apparatus, fabricated structural metal products, metal stampings, fabricated wire products, etc., core structural (barrels, cans, boxes, plates, etc.); heat exchangers, steam and barometric condensers, and valves; and nuclear reactors, reactor components and equipment.

**Item 8.18 – Engines and Turbines (SIC 351)**

Steam engines, steam gas and hydraulic turbines, diesel and other internal combustion engines, n.e.c.

**Item 8.19 – Farm and Garden Machinery and Equipment (SIC 352)**

Farm machinery, including tractors for farm use.

**Item 8.20 – Construction, Mining, and Materials Handling Machinery and Equipment (SIC 353)**

Construction mining and oil field machinery and equipment, elevators, conveyors, hoists, industrial trucks, tractors, trailers, and stackers.

**Item 8.21 – Metal working Machinery and Equipment (SIC 354)**

Machine tools, dies, machine tool accessories, rolling mill machinery, power-driven hand-tools, and wire fabricating machinery and equipment.

**Item 8.22 – Office, Computing, and Accounting Machines (SIC 357)**

Electronic computing equipment; calculating and accounting machines; typewriters; other computing and office machines (except laboratory scales and balances).

**Item 8.23 – Other Machinery, Except Electrical (Balance of SIC 35)**

Special industrial machinery, except metalworking, such as food products machinery, textile and paper industries machinery, general industrial machinery and equipment, and miscellaneous machinery except electrical. Includes pumps, air and gas compressors, and industrial process furnaces and ovens. Includes atomic fuel holding equipment; control rod drive mechanism and components for use on nuclear reactors.

**Item 8.24 – Electric Transmission and Distribution Equipment (SIC 361 and 3825)**

Electric measuring instruments and test equipment power, distribution and specialty transformers, switchgear and switchboard transformers, etc.

**Item 8.25 – Electrical Industrial Apparatus (SIC 362)**

Electric motors and generators, motor starters and controls, carbon and graphite brushes, electrodes. Nonelectronic capacitors, condensers, and rectifiers.

**Item 8.26 – Radio and Television Receiving Equipment, Except Communication Types (SIC 365)**

Radio and television sets, home recorders, prerecorded magnetic tapes, microphones, speaker systems, turntables, phonograph records, compact disc players, etc.

**Item 8.27 – Communications Equipment (SIC 366)**

Telephone and telegraph apparatus, radio and television transmitting, signaling, and detection equipment and apparatus.

**Item 8.28 – Electronic Components and Accessories (SIC 367)**

Semiconductors, computer logic modules, computer chips, solid state electronic devices, integrated circuits, electronic capacitors, transformers, connectors, cathode ray tubes, solar cells, solid state photovoltaic devices, etc.

**Item 8.29 – Other Electrical Machinery Equipment and Supplies (Balance of SIC 36)**

Household appliances, electric lighting and wiring equipment, atom smashers, and miscellaneous electrical machinery, equipment and supplies.

**Item 8.30 – Motor Vehicles and Equipment (SIC 371)**

Motor vehicles such as ambulances, fire engines, personnel carriers, amphibian motor vehicles, truck and automobile trailers, and motor vehicle parts and accessories.

**Item 8.31 – Aircraft and Parts (SIC 372)**

Piloted and unpiloted aircraft and parts of all types, including engines and auxiliary equipment such as landing gear, de-icing equipment, and other auxiliary equipment specifically adopted for aircraft. Exclude radar and radio equipment, electronic sighting devices and aeronautical instruments which should be reported in product group 32.

## **ITEM BY ITEM INSTRUCTIONS – Continued**

### **Item 8.32 – Missiles and Space Vehicles (SIC 376)**

Include frames or structures launching and handling support equipment and work on the missile system and space as a whole. Exclude electronic guidance control subassemblies and radar which should be reported in product group 35.

### **Item 8.33 – Other Transportation Equipment (Balance of SIC 37 Except 3795)**

Ship building, boat building and repairing, railroad equipment, motorcycles, bicycles, and parts, etc. Exclude tanks and tank components which are in product group 16.

### **Item 8.34 – Scientific and Mechanical Measuring Instruments (SIC 381, 382 Part)**

Engineering, laboratory, scientific, and research instruments, and associated equipment; automatic controls for regulating residential and commercial environments and appliances; industrial instruments for measurement, display, and control of process variables; nonelectric fire detecting systems, totalizing fluid meters and counting devices; instruments for measuring and testing electricity and electrical signals, and radar systems and equipment; accessory instrumentation for reactor control.

### **Item 8.35 – Optical, Surgical, Photographic, Timing and Other Instruments (Balance of SIC 38, SIC 382 Part)**

Optical instruments and lenses; surgical and medical instruments and apparatus; dental equipment and supplies; ophthalmic goods including contact lenses; optical fire control equipment; photographic equipment and supplies including film and motion picture apparatus; watches, clocks, clockwork operated devices and parts, appliance timers, chronometers.

### **Item 8.36 – Computer Programming, Data Processing, and Other Computer Related Services (SIC 737)**

Includes computer programming services, prepackaged software, computer integrated systems design, computer processing and data preparation and processing services, information retrieval services, computer facilities management services, computer rental and leasing, computer maintenance and repair.

### **Item 8.37 – Other**

Please write-in the category.

### **Item 9 – COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY STATE**

Report the cost of R&D for each State in which your company has research and development laboratories or facilities. It is not necessary to calculate separately individual assignments which may be made outside the home State of a particular research staff.

As much as 10 percent of the total may, if desired, be reported in line 52 as "Not distributed by State."

### **Item 10 – ENERGY RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY**

Include all spending for R&D to increase energy resources or capabilities, including the development of energy equipment. Energy research and development can include costs of R&D projects (both product and process) on exploration, extraction, transportation, processing, storage, generation (including conversion), distribution, conservation, etc., of present, new, or improved forms of energy. Record energy R&D spending according to type of energy in Items 10A through 10E.

If R&D spending is for joint or multiple purposes, estimate and report the portion of cost incurred for the energy purpose. In the limited number of cases where the separation of joint (multiple) costs by type of energy cannot be estimate, include the total cost of the R&D project when the primary purpose of the project is energy research and development. If the project is not primarily for energy research and development then exclude all of the project cost.

#### **Item 10B4 – Coal**

"Synthetic fuels" includes programs designed to convert coal to gaseous and liquid products. "Mining" is composed of programs for developing equipment and techniques to improve the productivity and recovery rates of coal mining.

#### **Item 10C3 – Conservation and Utilization**

Includes R&D activities undertaken to reduce consumption either at the point of energy use or in the transmission, transportation, storage, and conversion of energy. Examples of such are R&D undertaken primarily to reduce fuel consumption in manufacturing, to improve the efficiency of transportation of energy products, or to produce an end product which is more efficient in energy consumption.

#### **Item 10D – All Other Energy**

Includes areas such as wind, waste, hydroelectric, etc. Also include in this category the development of energy equipment which cannot be readily classified in Items 10A through 10C.

### **Item II- POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY**

Includes R&D spending for the purpose of reducing or eliminating the emission of pollutants. "Pollution" refers to the emission of pollutants to the outside of a firm's property or activities; "abatement" includes prevention, treatment, or recycling.

Exclude costs:

- to contribute to environmental aesthetics
- to increase equipment durability in corrosive environments
- to conserve energy (include as energy R&D in item 5.3.)
- to conserve natural resources
- to increase employee comfort, safety, and health

## **ITEM BY ITEM INSTRUCTIONS – Continued**

If the only purpose of the R&D spending is pollution abatement, include the total expenditures on the project. If pollution abatement is only one of several purposes, report only the R&D costs associated with pollution abatement. When the separation of joint costs is not feasible, include the total R&D costs for a project if the purpose is primarily (more than 50 percent) for pollution abatement.

If the project is not primarily for pollution abatement purposes, exclude all of the project costs. Also exclude project costs if expected pollution abatement benefits are obtained at no extra cost.

### **Item 11A – Air**

- 1. Automotive emissions** includes all R&D efforts undertaken to reduce exhaust emissions from automobiles.
- 2. Electric power plants emissions** includes efforts directed toward reducing airborne emissions from electric power plants.
- 3. "All other"** includes efforts directed at removing sulfur oxide, nitrogen oxides and particulates, and other fossil-fuel pollutants from the atmosphere.

### **Item 11B – Water**

Includes R&D spending on water recirculation or thermal pollution abatement, etc.

### **Item 11C – Solid Waste**

Includes R&D spending on waste compacting devices, etc.

### **Item 11 D – Other**

Includes R&D spending on pollution abatement from noise and radiation, etc.

### **Section III – RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS**

This section of the report form covers the R&D reported in item 3.C of section I, on page one.

### **Item 12 – FOREIGN RESEARCH AND DEVELOPMENT BY COUNTRY**

Allocate the totals reported in Item 3.C., column 5 by the country in which your various research and development takes place. Estimate the costs associated with each country. If necessary, you may write in countries not listed.

### **Item 13 – COVERAGE AND OPERATIONAL STATUS**

#### **Item 13A**

Check the appropriate box if the domestic company expenditures on this form, including all subsidiaries, have R&D. If no, please explain in remarks section or in a transmittal letter.

#### **Item 13B**

Provide the name and address of the new owner. In the "Remarks" section, specify change or correction, e.g., wholly-owned subsidiary of ABC Company, "merger with XYZ Company", "acquired by 123 Corporation".

### **Item 14 – CERTIFICATION**

Report the name and telephone number of the person to contact regarding this report. Please sign and date the form.

If you wish to correspond by E-mail, please provide your E-mail address in the "Remarks" section.

### **WARNING CONCERNING ELECTRONIC MAIL –**

The Internet is NOT a secure means of transmitting information unless it is encrypted. If you choose to communicate with the Census Bureau via electronic mail, the Census Bureau cannot guarantee the privacy of the information while transmitted, but will safeguard it in accordance with Title 13. Be advised that making inquiries regarding this survey via electronic mail may divulge your participation in this survey.

FORM RD-1A  
(10-30-97)U.S. DEPARTMENT OF COMMERCE  
BUREAU OF THE CENSUS**SURVEY OF INDUSTRIAL RESEARCH AND  
DEVELOPMENT DURING 1997**

**NOTICE-Your** report to the Census Bureau is **confidential** by law (title 13, US. Code).

The instructions and definitions on this form are not complete. Please read the enclosed instruction sheet before completing this form.

**RETURN TO**

BUREAU OF THE CENSUS  
1201 East 10th Street  
Jeffersonville, IN 47132-0001

Data supplied in items 2A and B and in item 3A.3, columns 1 and 3 for 1997 on this form will satisfy the mandatory reporting requirements (title 13, U.S. Code).

FROM THE DIRECTOR  
BUREAU OF THE CENSUS

We have enclosed your company's report form and instructions for the 1997 "Survey of Industrial Research and Development." **Please read the definition of R&D on page 2 of the form** and review Item 1. If your company does not conduct R&D, please call the Touchtone Data Entry system (TDE) to report on 1-800-851-2014.

**If your company conducted research and development in 1997, please review the instructions, complete the form, and return it within 60-days.** Federal law requires your response to four items identified on the form. Your voluntary response to all other items are needed to assure useful results.

This survey provides information for examining R&D tax credits which may allow some businesses to reduce their Federal tax burden. The data assist public officials in allocating research funding by state which may well benefit companies like yours. Analysts also use the results to compare R&D spending in this country with others to ensure that U.S. businesses are not at a competitive disadvantage.

Information you report should cover the domestic operations of your consolidated enterprise for calendar year 1997. We recognize that providing this information is a burden, and we have worked hard to minimize it. For example, if you do not have book records for any item, **you may provide carefully prepared estimates.** The law that authorizes this survey (Title 13, United States Code) requires that we keep your report in full confidence. Only sworn Census Bureau employees will see your information, and they will use it only for statistical purposes.

We conduct this survey with National Science Foundation (NSF) support. We have enclosed a letter from the Director of the NSF encouraging your response to the survey. If you have any questions, please call my staff on 301-457-1339. Thank you in advance for your cooperation.

Sincerely,

Martha Farnsworth Riche

**PLEASE OPEN AND BEGIN THE SURVEY WITH ITEM 1.**

## RESEARCH AND DEVELOPMENT

R&D includes basic and applied research in the sciences and engineering. It also includes design and development of new products and processes and enhancement of existing products and processes.

R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences such as chemistry and physics, the biological sciences such as medicine, and engineering and computer science. R&D includes these activities if the purpose is to do one or more of the following things:

1. Pursue a planned search for **new knowledge**, whether or not the search has reference to a specific application. (Basic Research)
2. Apply **existing knowledge** to problems involved in the **creation of a new product or process** including work required to evaluate possible uses. (Applied Research)

### ► Item 1- CHECK FOR RESEARCH AND DEVELOPMENT

Mark (X) the appropriate box.

- 201  Company had R&D in 1997 – Complete form, enter zeros where applicable, and return this form.  
203  Company does not conduct R&D – Call TDE to report (1-800-851-2014). Do not mail form.

**NOTE** – After reviewing Item 1 if you need further assistance please call (301) 457-1339.

### ► Item 2 – RECEIPTS, EMPLOYMENT AND NUMBER OF SCIENTISTS AND ENGINEERS FOR COMPANY

- A. Net sales, operating receipts and revenues of domestic operations of this company. (Report in thousands of dollars)

**INCLUDE** receipts for sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries from all domestic operations of your company.

|     | Bil. | Mil. | Thou. | Dot. |
|-----|------|------|-------|------|
| 102 | \$   |      |       | 000  |

|     | Number |
|-----|--------|
| 112 |        |

3. **Report** domestic company employment in all activities during the pay period which includes the 12th of March 1997. (Item 1 of I.R.S. Form 941, if Form 941 was filed for the entire company.)

|              |        |
|--------------|--------|
| January 1998 | Number |
| 502          |        |

2. **Report** the full-time equivalent number of R&D scientists and engineers employed in January 1998. For employees whose activities are not solely devoted to research and development, report the proportion of their time that is devoted to research and development. (See instructions for examples)

**Item 3 - COSTS INCURRED FOR RESEARCH AND DEVELOPMENT IN 1997**

|   |          | Source of funds |      |                          |      | Total ((1) + (2))<br>(3) |      |       |      |
|---|----------|-----------------|------|--------------------------|------|--------------------------|------|-------|------|
|   |          | Federal<br>(1)  |      | Company and other<br>(2) |      |                          |      |       |      |
|   |          | Bil.            | Mil. | Thou.                    | Dol. | Bil.                     | Mil. | Thou. | Dol. |
| <b>A. Performed within the company</b>  |          |                 |      |                          |      |                          |      |       |      |
| <b>1. Basic research</b>  | 300      |                 |      |                          |      |                          |      |       |      |
| If "None," please mark (X) → c /  |          |                 |      |                          |      |                          |      |       |      |
| <b>2. Applied research and development</b>  |          |                 |      |                          |      |                          |      |       |      |
| <b>a. Applied research</b>  |          | \$ 314          |      |                          |      | \$ 315                   |      |       |      |
| <b>b. Development</b>   |          | \$ 324          |      |                          |      | \$ 325                   |      |       |      |
| <b>c. Total (Sum of lines a and b)</b>  | → \$ 344 |                 |      |                          |      | \$ 345                   |      |       |      |
| <b>3. TOTAL (Sum of lines 1 and 2c)</b>   | → \$ 354 |                 |      |                          |      | \$ 355                   |      |       |      |
| <b>B. Outside the company – Federal funds and company funds for research and development performed by others outside the United States (Exclude from 3A,3 above)</b>                                    |          |                 |      |                          |      |                          |      |       |      |
| <b>C. Foreign – Company funds for research and development performed by foreign subsidiaries or other organizations outside the United States (Exclude from 3A,3 and 3B above)</b>                      |          |                 |      |                          |      |                          |      |       |      |
| <b>D. TOTAL – Company and other funds, except Federal</b><br>(This line represents company sponsored research and development with the exception of "other funds." (Sum of 3A,3 (column 2), B, and C) → |          |                 |      |                          |      |                          |      |       |      |
| <b>Item 4 - COMPANY AND OTHER FUNDS EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1998</b>  |          |                 |      |                          |      |                          |      |       |      |

**Item 5A – COVERAGE AND OPERATIONAL STATUS**

Are research and development costs for the entire consolidated domestic enterprise, including subsidiaries, reported on this form?

Yes       No – Please explain in remarks below.

Was this company owned or controlled by another company on December 31, 1997?

Yes – Complete 5B. Date acquired →  No

**Item 5B – NEW OWNER INFORMATION** (See instructions for Coverage Review)

|   |             |              |        |
|---|-------------|--------------|--------|
| 602 Name  | 603 Address |              |        |
| 604 City  | 605 State   | 606 ZIP Code |        |
| <b>CHECK ITEM</b> Please complete the check list below BEFORE returning this questionnaire. By checking these items you will reduce the likelihood of our calling you to resolve an error or inconsistency.   |             |              |        |
| <b>In item 2A:</b><br>1. Sales is reported in <b>thousands</b> of dollars . . .   |             |              |        |
| <b>In item 2B:</b><br>2. Your answer describes the number of <b>employees</b> , NOT company payroll . . .   |             |              |        |
| <b>In item 3:</b><br>3. Verify that <b>Federal funds</b> (column 1) plus <b>Company funds</b> (column 2) equals <b>Total funds</b> (column 3) for:<br>Basic research (3A.1), applied research (3A.2a), development (3A.2b), total applied research and development (3A.2c), and total costs within the company (3A.3) |             |              |        |
| <b>IF THE ANSWER TO ANY OF THE ABOVE CHECKS IS "NO": PLEASE MAKE THE NECESSARY CORRECTIONS IN THE APPROPRIATE ITEM(S) OR PROVIDE AN EXPLANATION IN THE REMARKS SECTION.</b>   |             |              |        |
| <b>Item 6 – CERTIFICATION</b> – This report is substantially accurate and has been prepared in accordance with instructions.<br>Name of person to contact regarding this report   |             |              |        |
| Signature of authorized official  | Title       | Area Code    | Number |
|   |             | 701 Date     |        |

, Remarks (If you wish to correspond by E-mail, please place your E-mail address here.)

**INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH  
AND DEVELOPMENT DURING 1997  
FORM RD-1A**

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## GENERAL INSTRUCTIONS

Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development (R&D) not available from any other source. By carefully completing this report, the accuracy of this information is assured.

**DUE DATE** - Please complete and return this form in the envelope provided within 60 days. Make a copy for your records.

**SURVEY SCOPE** - This report covers publicly traded and privately-owned, nonfarm business firms in all sectors of the United States economy. It does not include operations owned by Federal, state or local governments, nonprofit organizations, or trust or pension plans.

If your company is owned by a Federal, state or local government, is a nonprofit organization, or is a trust or pension plan which performs no activity other than investments, do not report. Please note in the remarks section on the back page of the form and return it.

**REPORTING ENTITY** - Report research and development activities for all domestic operations of your **entire consolidated domestic enterprise**, including subsidiaries and divisions. The term "company" in these instructions refers to the consolidated domestic enterprise. Report for all parts of the company located in the 50 states and the District of Columbia. Report net receipts and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 states or the District of Columbia.

If this form has been directed to a holding company, report for all subsidiaries and operations under the ownership and control of the holding company.

**COVERAGE REVIEW** - Check the appropriate box if this company was owned or controlled by another company on December 31, 1997. If yes, follow the instructions below:

- If your company is owned by a foreign company, please complete the form and fill out the new owner information on the back page of the form.
- If your company was purchased by another company on or prior to March 31, 1997, please complete the new owner information on the back page of the form, sign the form in Item 6, and fax the form to (301) 457-1318.
- If your company was purchased after March 31, 1997, please complete the form for the months prior to the purchase of your company, fill out the new owner information on the back page of the form, and return the form in the envelope provided.

If you have questions, please call the R&D Survey staff at (301) 457-4677 to determine whether you are required to complete the form.

**PERIOD COVERED BY THE REPORT** - Report figures for calendar year 1997. Fiscal year data are acceptable for all items except for employment, provided your fiscal year ends between September 1997 and March 1998. Please report employment figures (Items 2B and 2C) for the specific times indicated for these items.

**HOW TO REPORT** - Report all value figures in thousands of dollars. If you cannot answer a question from your company records, please estimate the answer carefully.

Example: 1,123,678,599 dollars.

| Bil.   | Mil. | Thou. | Dol. |
|--------|------|-------|------|
| Report | \$1  | 123   | 679  |

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124

| Bil.   | Mil. | Thou. | Dol. |
|--------|------|-------|------|
| Report | \$1  | 124   | 000  |

**ADDITIONAL FORMS** - Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 218-3331.

**FILING EXTENSIONS** - If you cannot complete the form in 60 days, request an extension of time by:

- calling the Census Touchtone Data Entry System on 1-800-851-2014 (have your 10-digit Census File Number, "CFN", available. The CFN is printed on the form above your address.)

OR

- writing to the address below (Please include your 10-digit Census File Number):

Bureau of the Census  
1201 East 10th Street  
Jeffersonville, IN 47132-0001

**BURDEN HOUR ESTIMATE** - Public reporting burden for this collection of information is estimated to average 1 hour per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information including suggestions for reducing this burden to Gail A. McHenry, National Science Foundation, 4201 Wilson Boulevard, Room 485, Arlington, VA 22230.

Direct **QUESTIONS** regarding this form to the Bureau of the Census, Manufacturing and Construction Division, ATTN.: Special Studies Branch, Room 2135/4, Washington, DC 20233-6900, call (301) 457-1339 or E-mail to ronald.w.taylor@ccmail.census.gov. (Please see the instructions for Item 6 on page 6 for E-mail warning.)

## **DEFINITION OF RESEARCH AND DEVELOPMENT**

R&D includes basic and applied research in the sciences and engineering: it also includes design and development of new products and processes and enhancement of existing products and processes.

R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences such as chemistry and physics, the biological sciences such as medicine, and engineering and computer science. R&D includes these activities if the purpose is to do one or more of the following things:

1. Pursue a planned search for **new knowledge**, whether or not the search has reference to a specific application. (Basic research)
2. Apply **existing knowledge** to problems involved in the **creation of a new product or process**, including work required to evaluate possible uses. (Applied research)
3. Apply **existing knowledge** to problems involved in the **improvement of a present product or process**. (Development)

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of your responses.

Activities to be **EXCLUDED** from R&D:

- Routine product testing
- Geological and geophysical exploration activities
- Technical services such as:
  - quality and quantity control
  - technical plant sanitation control
  - trouble-shooting in connection with breakdowns in full-scale production
- Advertising programs to promote or demonstrate new products or processes
- Assistance in preparation of speeches and publications for persons not engaged in research and development.
- Social Science R&D which is defined to encompass those activities devoted to further understanding the behavior of groups of human beings or of individuals as members of groups. Some of the topics include the following:
  - Personnel R&D
  - Economic R&D
  - Artificial intelligence and expert systems R&D
  - Consumer, market, and opinion R&D
  - Engineering psychology R&D
  - Management and organization R&D
  - Actuarial and demographic R&D
  - Educational processes and applications R&D
  - R&D in law

## **ITEM BY ITEM INSTRUCTIONS**

### **Item 1 – CHECK FOR RESEARCH AND DEVELOPMENT**

Check the box that best describes the R&D activities of your company. If your company performed R&D in 1997 then check box 201 and continue with Item 2.

If your company did **not** conduct R&D in 1997 then **call the Census Touchtone Data Entry system at 1-800-851-2014 to complete the survey.**

Have your 10-digit Census File Number (CFN) ready before calling. The CFN is located above the address. This system will allow you to report that your company performed no R&D in 1997. Do not mail in the form.

Alternatively, check the appropriate box, 203, on the form. Do not complete the data items. Go to Item 6, sign and return the form in the envelope provided. **You must call or mail in the form to complete your reporting requirements for the survey.**

### **Item 2A – Net Sales, Operating Receipts and Revenues**

Include:

- Sales, operating receipts and revenues from all domestic operations of the company. This includes receipts from sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries.
- Net selling value of shipments, f.o.b. plant, after discounts and allowances minus freight charges and excise taxes
- Revenue from investments, rents, and royalties only if it is the principal business of the company. Finance, Insurance and Real Estate companies should include interest, dividends, commissions and rental income as part of revenues.
- Value of assets sold under a capital lease agreement
- Export transfers to your foreign subsidiaries

### **Item 2 – RECEIPTS, EMPLOYMENT AND NUMBER OF SCIENTISTS AND ENGINEERS FOR COMPANY**

## **ITEM BY ITEM INSTRUCTIONS – Continued**

### **Item 2A – Net Sales, Operating Receipts and Revenues – Continued**

Exclude:

- Sales and other taxes collected and paid directly to government taxing agencies
- Domestic intra-company transfers
- Receipts from sale of products and services provided by your foreign subsidiaries
- Income from interest, dividends and commissions, except for Finance, Insurance and Real Estate companies
- Other nonoperating income (e.g., royalties)

### **Item 2B – Domestic Company Employment**

Include:

- The number of full and part-time employees of the company as defined on Treasury Form 941, Employer's Quarterly Federal Tax Return, and Circular E, Employer's Tax Guide, if filed for the entire company.
- The number of employees in all activities in the 50 States and the District of Columbia during the pay period which includes March 12, 1997.
- Persons on paid sick leave, paid holidays, and paid vacations during the pay period which includes March 12, 1997.

Report the number of employees, not payroll.

### **Item 2C – Number of Research and Development Scientists and Engineers**

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics. Their experience is equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number of scientists and engineers employed in January, 1998.
2. For employees whose activities are not solely devoted to R&D, report the proportion of their time that is devoted to R&D. For example, if a company had the full-time equivalent of 60 scientists and engineers in January 1998 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

### **Item 3 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT**

#### **► Source of Funds for Research and Development Costs**

##### **Federal funds**

Include:

- Federally-sponsored research and development performed within the company. Include only the amount of work done on Federal R&D contracts or subcontracts in the current year.
- R&D portion of procurement contracts or subcontracts

Exclude:

- For Item 3A exclude Federal R&D contracts and R&D portions of procurement contracts that your company subcontracted to other R&D organizations. Including these funds would cause duplication in the statistical totals, which include data on work actually performed by each company. Report subcontracted costs in Item 3B.
- Expenditures for independent research and development (IR&D). These are included in company funds. (See definition below.)

##### **Company and other funds**

Include:

- Company-sponsored research and development performed within the company and R&D performed under contract from non-Federal sources
- Costs for independent research and development (IR&D). We define IR&D funds as R&D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services. Qualified projects usually have potential interest to the Department of Defense or other agencies of the Federal government. These IR&D funds are excluded from federal funds received for federally-sponsored research and development contracts.
- Costs for which you anticipate reimbursement as company funds. Report expenditures in the period for which they are incurred. Do not include the actual reimbursement.

### **Item 3A – PERFORMED WITHIN THE COMPANY**

#### **► Types of R&D Costs**

**Include** as R&D costs:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation

## ITEM BY ITEM INSTRUCTIONS - Continued

### **Item 3A - PERFORMED WITHIN THE COMPANY - Continued**

#### ► **Types of R&D Costs - Continued**

**Include** as R&D costs - Continued:

- Cost of computer software used in R&D activities
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expenses
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

**Exclude** as R&D costs:

- Capital expenditures
- Patent expenses
- Income taxes and interest
- R&D performed abroad (see Item 3C), such as in Canada and Puerto Rico
- R&D performed by non-company R&D organizations of any kind (see Item 3B)
- Portion of company-held R&D contracts that are subcontracted outside the reporting company (see Item 3B)
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

#### **Item 3A.1 - Basic Research**

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, although they may be in the fields of present or potential interest to the reporting company.

If your company performs no basic research, please check the box in item 3A.1 and report zeros in line 1, columns 1, 2 and 3.

#### **Item 3A.2a - Applied Research**

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

#### **Item 3A.2b - Development**

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research into products or processes.

Include:

- Software development
- Design and operation of pilot plants and semi-work plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models including test models for defense contracts
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals

Exclude:

- Routine technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

#### **Item 3A.2c - Total Costs for Applied Research and Development**

Add line 3A.2a and line 3A.2b.

#### **Item 3A.3 - Total Costs for Basic and Applied Research and Development Performed Within the Company**

Add line 3A.1 and line 3A.2c.

#### ► **Estimating basic, applied, and development expenditures**

If your company does not keep records that can be allocated to these specific categories, estimate by the following:

1. Isolate projects that clearly fall into the development category of R&D costs. If your company fabricates products, development activity will include the design, construction, and testing of prototypes and models. If your company's R&D involves the development of a "process" as in chemicals and petroleum, this development activity would primarily include the design and operation of pilot plants or semi-work plants.
2. Isolate the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. R&D work performed in production units as well as in various laboratories is generally classified as development R&D.
3. Distribute the balance of R&D costs on the basis of individual projects or on the basis of other summaries of the work.

## **ITEM BY ITEM INSTRUCTIONS - Continued**

### **Item 3B ~ OUTSIDE THE COMPANY**

Report payments in the form of contracts, grants, and fellowships made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions or other organizations.

Federal Funds (column 1): Report R&D activities that your company subcontracted to other organizations using **federal funds** you received for R&D contracts and R&D portions of procurement contracts.

Company and Other Funds (column 2): Report R&D activities that your company subcontracted to other organizations using **company or other nonfederal funds**.

### **Item 3C - FOREIGN**

Report the amount of R&D financed by the U.S. parent or its foreign subsidiaries, including Canada and Puerto Rico, and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States. Foreign subsidiaries are those outside the 50 States and the District of Columbia.

Exclude R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations.

### **Item 3D - TOTAL**

With the exception of "Other funds," this number represents company-sponsored R&D. It is comparable to information reported on Form 10K, if you report to the Securities and Exchange Commission.

Add line 3A.3 (column 2), line 3B (column 2) , and line 3C.

### **Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1998**

Report the estimated cost of company and other nonfederally sponsored R&D that will be performed within the 50 states and the District of Columbia in 1998. This item is comparable to the 1997 figure reported in Item 3A.3, column 2.

### **Item 5A - COVERAGE AND OPERATIONAL STATUS**

Check the appropriate box indicating whether or not R&D costs for the entire consolidated domestic enterprise, including subsidiaries were reported on this form. If no, please explain in the remarks section.

Check the appropriate box whether this company was owned or controlled by another company on December 31,1997. If yes, please report the month and year your company was acquired and fill out the new owner information in Item 5B. Please see "COVERAGE REVIEW" in the General Instructions for a description of how to proceed in filling out the form.

### **Item 5B - NEW OWNER INFORMATION**

If the company was owned or controlled by another company on December 31,1997, provide the name and address of the new owner. In the "Remarks" section, specify the change or correction, e.g., wholly-owned subsidiary of ABC Company", "merger with XYZ Company", "acquired by 123 Corporation".

### **CHECK ITEM**

Mark "Yes" or "No" as appropriate for each of the checks in this item. If the answer is "No" provide an explanation in the remarks section.

### **Item 6 - CERTIFICATION**

Report the name and telephone number of the person to contact regarding this report. Please sign and date the form.

If you wish to correspond by E-mail, please put your E-mail address in the remarks section.

**WARNING CONCERNING ELECTRONIC MAIL:** The Internet is not a secure means of transmitting information unless it is encrypted. If you choose to communicate with the Census Bureau via electronic mail, the Census Bureau cannot guarantee the privacy of the information while transmitted, but will safeguard it in accordance with Title 13. Be advised that making inquiries regarding this survey via electronic mail may divulge your participation in this survey.